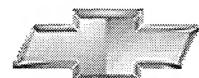


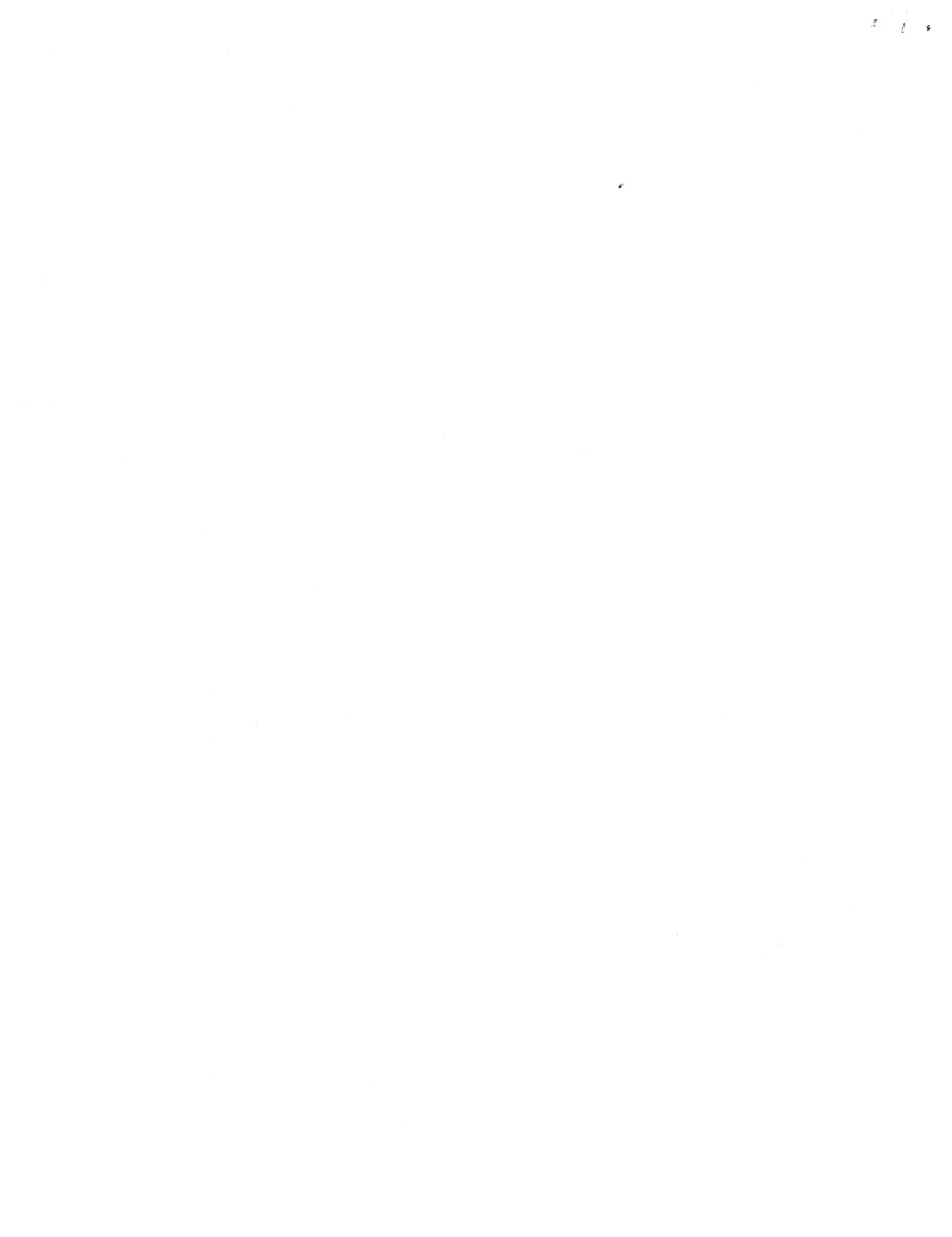
# Chevrolet



# Express Van



# 2000



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## Product Information

### **2000 Chevy Express – Versatility and Value in a Full-Size Package**

**DETROIT** – The hardworking Chevy Express full-size van continues to offer a variety of models, packages and wheelbases and an enhanced V6 engine for 2000.

This year's improvements begin with the Vortec 4300 V6 SFI engine that offers quieter operation, extended durability and reduced emissions over last year. Three new exterior paints include Indigo Blue Metallic, Onyx Black and Victory Red. A new rear defogger is available on all models equipped with swing-out rear windows, or fixed rear glass.

"Express has a unique blend of rugged, workhorse qualities with exceptional comfort and roominess," says John Gaydash, Express brand manager. "If you're looking for a dependable, passenger or cargo van with lots of standard safety features, Express is it."

Chevy Express is available as a Cargo Van, Passenger Van and as a Conversion Van with the optional Upfitter Package. Models include the G1500, G2500 and G2500 Extended Wheelbase, G3500 and G3500 Extended Wheelbase. Available Base and LS trim levels on Passenger Van models round out the Express lineup.

Depending on the model, Chevy Express offers five engine choices and two distinctly different 4-speed electronically controlled automatic transmissions designed with demanding performance in mind. Top output for the Vortec 7400 V8, the largest available engine for Express, is an outstanding 290 horsepower @ 4000 rpm, with torque of 410 lb.-ft. @ 3200 rpm.

Key safety and security features include: driver- and front-passenger air bags, a reinforced safety-cage construction, child security rear door locks, 4-wheel antilock brakes (ABS) and Daytime Running Lamps (DRL) that help make the vehicle more visible to oncoming drivers during daylight hours.

Express Cargo Van models include handy interior features, such as dual front cup holders, an auxiliary 12-volt power outlet and passenger assist handles. Express Passenger Van models add standard front air conditioning and an AM/FM stereo. Express Passenger Van offers a wide variety of seating configurations. Depending on model, five-, eight-, twelve- or fifteen-passenger seating is available in Custom Vinyl or Custom Cloth.

A true leader in its segment, both the Express Passenger Van and Cargo Van models excel in their respective areas. Express Cargo Van provides superior work efficiency, while Express Passenger Van offers unsurpassed people-moving capabilities.

Chevy Express – the versatile, value-packed full-size van.

## What's New And Highlights

### Interior

- Available rear defogger on all full-size vans.

### Exterior

- Available Light Autumnwood striping with LS trim

Three new colors:

- Indigo Blue Metallic
- Onyx Black
- Victory Red.

### Seating Packages



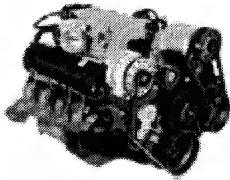
Express Passenger Van provides a variety of seating packages.

### Upfitter Package



Chevy Express Cargo Van offers a comprehensive Upfitter Package

### Engines



- Vortec 4300 V6 engine enhancements.
- Five available engines give customers a wide choice.

### Brakes



Standard 4-wheel antilock brakes help ensure reliable stopping.

## **Model Summary**

- Chevy Express Cargo Van
- Chevy Express Passenger Van
- Chevy Express Conversion Van (Upfitter Package)
- 1500 Models
- 2500 Models
- 2500 Extended Wheelbase Models
- 3500 Models
- 3500 Extended Wheelbase Models.

## **Marketplace**

When it comes to versatility, Chevy Express has it. Customers can choose from a variety of models and packages: 1500, 2500 and 3500 Series vans and two wheelbases, including a handy Extended Wheelbase model. Chevy Express is as much "at home" hauling a load of cargo, as it is carrying up to 15 passengers. Its roominess and comfort appeal to a wide range of prospects, including commercial cargo customers, commercial fleets, small businesses and families.

## **Competitors:**

- Ford Econoline Van/Wagon
- Dodge Ram Van/Wagon.

## Vehicle Overview

### Interior Overview

#### Key Standard Features\*

##### Chevy Express Cargo Van Model:

- Dual front cup holders
- Auxiliary 12-volt power outlet
- ETR AM/FM stereo with seek-scan, digital clock and two speakers
- Embossed black vinyl floor covering
- Vinyl reclining high-back front bucket seats
- Ergonomically designed instrument panel
- Molded armrests and convenient, deep storage compartments
- Passenger assist handles
- Solar-Ray light-tinted glass
- Variable intermittent windshield wipers
- Headlamps-on reminder.

##### Chevy Express Passenger Van Model Adds The Following, In Addition To Or Replacing Cargo Van Features:

- Front air conditioning
- Composite trim panels, color-keyed cloth sunshades, full-length headliner
- ETR AM/FM stereo with seek-scan, digital clock and four speakers
- Vinyl reclining front bucket seats and rear bench seat(s).

##### Chevy Express LS Passenger Van Adds The Following, In Addition To Or Replacing Passenger Van Features:

- Full-floor color-keyed carpeting and vinyl floor mats
- Tilt-Wheel™ steering column and cruise control
- Auxiliary lighting
- Power door locks and power windows
- Front high-back bucket seats with inboard armrests and rear-bench seats in Custom Cloth.

##### Chevy Express Upfitter Package:

The available Express Cargo Van Upfitter Package (RPO YF7) provides authorized van converters with a well-equipped basic vehicle that's ready to receive upfitter-provided customer features that make it an ideal vehicle for recreation and travel.

#### Key Optional Features\*

- NEW Rear defogger is available on all models with deep-tint, swing-out rear windows, or Solar-Ray fixed glass
- Rear-area heating and air conditioning
- Remote Keyless Entry.

\* See Feature Availability Chart for additional features.

## Exterior/Structural Overview

### Key Standard Features\*

#### Chevy Express Cargo And Passenger Van Model:

- Daytime Running Lamps (DRL)
- 60/40 swing-out side doors
- Foldaway black, LH and RH mirrors
- 15" x 6" steel wheels
- Aerodynamic exterior design is both stylish and functional. Door and seal designs help shut out wind and noise and prevent water leaks.
- Concealed rear-door hinges are less susceptible to corrosion and allow the rear doors to open wide for easy loading of bulky objects. They also allow the vehicle to back up completely to loading docks and open so that the taillamps are visible while the vehicle is being loaded/unloaded
- Underbody-mounted full-size spare tire maximizes interior cargo room.
- 31-gallon fuel tank (approx.)
- Damage-resistant rear roof cap covers the area directly above the rear doors, helping to protect the paint from scrapes when loading and unloading roof rack equipment and tools
- Large roof drip rails channel rain away from entry doors
- Rugged full-length steel-frame chassis helps provide structural support for both the body and payload. Welded ladder-type construction helps the frame resist twisting and flexing. The frame design and long wheelbases help contribute to a smooth, quiet ride and stable handling. The floor design minimizes wheelhouse intrusion into passenger areas of the van. The Regular and Extended Wheelbase models have two separate-length frames for support along the entire length of the vehicle, unlike some competitive vehicles,† which use the same size frame for both regular and extended length van models
- Extensive corrosion protection results from using two-sided galvanized steel for exterior body panels (except the roof). The galvanized zinc coating prevents surface rust due to minor chips and scratches and helps prevent holes that start from the inside.

#### Chevy Express LS Model Adds:

- Chrome grille and dual composite halogen headlamps
- Bright wheel trim rings and bright center caps
- Chrome front and rear bumpers
- Body-side moldings.

### Key Optional Features\*

- Sliding side door is a no-cost option (not available with the optional YF7 Upfitter Package)
- 15" x 6" brushed aluminum wheels.

## Exterior Paint

Basecoat/clearcoat paint used on Chevy Express helps resist fading and provides a high gloss shine for long-lasting exterior beauty. Clearcoat finish is used with all colors — solids and metallics.

### Paint Colors

- Indigo Blue Metallic
- Onyx Black
- Victory Red
- Medium Bronzemist Metallic
- Light Autumnwood Metallic
- Medium Charcoal Gray Metallic

## 2000 Chevrolet Express Van Restoration Kit

- Medium Fernmist Green Metallic
- Summit White
- Dark Carmine Red Metallic.

\* See Feature Availability Chart for additional features.

## Functional Overview

### Key Standard Features\*

- Vortec 4300 V6 SFI engine (depending on model)
- 4-speed electronically controlled automatic transmission
- 4-wheel antilock brake system (ABS)
- PASSlock® theft-deterrent system
- Power steering.

\* See Feature Availability Chart for additional features.

## Safety And Security

### Crash Avoidance Features

- 4-wheel antilock brakes
- Daytime Running Lamps (DRL)
- Steering wheel center-mounted horn pad
- Brake/transmission shift interlock requires drivers to depress the brake pedal to shift out of PARK preventing unintended acceleration.

### Occupant Protection Features

- Driver and front-passenger air bags†
- Reinforced safety-cage construction
- Front and rear crush zones
- Front head restraints
- Manual lap/shoulder safety belts are located at center- and rear-row seat outboard positions, while lap safety belts are located at center positions. Front shoulder belts feature adjustable guides for personalized comfort
- Outboard rear shoulder belt comfort guides
- Child security rear door locks.

### Security Features

- PASSlock® theft-deterrent system, standard on all Chevy Express models, disables the fuel system unless the proper key is used. If an improper key is used, the vehicle will not start for as long as 10 minutes, even if the proper key is subsequently inserted
- Remote hood release
- Laser-etched Vehicle Identification Number (VIN) plate helps make forgery more difficult than with stamped VIN plates
- Theft-deterrent steering column lock.

## **Sound Systems**

### **All Models**

#### **Standard:**

- ETR AM/FM stereo with seek-scan and digital clock

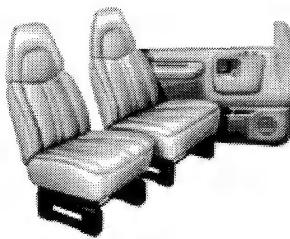
#### **Optional:**

- ETR AM/FM stereo with cassette player, seek-scan and digital clock and four speakers
- ETR AM/FM stereo with compact disc player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- ETR AM/FM stereo with compact disc and cassette players, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control.

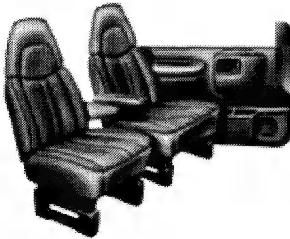
### **Uplevel Sounds Systems:**

Uplevel sound systems (optional on Chevy Express Passenger Van and Cargo Vans with the RPO YF7 Upfitter Package) include auto-tone control which sets equalizer levels with one touch for rock, country, pop, jazz, classical and news programs. These systems also include the anti-theft protection of the TheftLock security feature. With TheftLock, once the radio code is set by the owner, the radio will not operate if it is removed from the vehicle. Additionally, to help compensate for road noise, these systems include speed-compensated volume, which automatically adjusts sound volume as vehicle speed increases.

## Seats



Standard high-back vinyl front bucket seats.



Optional Custom Cloth reclining high-back front bucket seats with inboard armrests and seatback map pockets.

### Chevy Express Passenger Van:

- Seating configurations include the following (availability depends on model selected):
  - Five-passenger seating (two front buckets, one rear bench)
  - Eight-passenger seating (two front buckets, two rear benches)
  - Twelve-passenger seating (two front buckets, three rear benches)
  - Fifteen-passenger seating (two front buckets, four rear benches).

### Chevy Express Cargo Van:

Standard driver and front-passenger reclining high-back vinyl front bucket seats with a passenger-seat delete option available (also deletes passenger side air bag).

### Interior Colors

- Medium Gray
- Blue
- Neutral.

## Powertrain and Performance

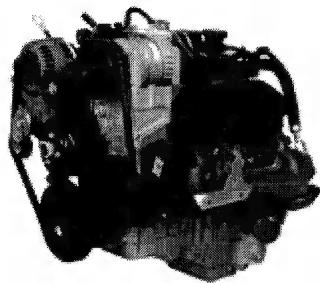
### Engineering

Chevy Express relies on a solid foundation to provide a smooth ride and good handling characteristics. It starts with a carbon steel ladder-type frame with fully-boxed side rails that resist twisting and flexing. An independent Short/Long Arm (SLA) front suspension and computer-selected springs contribute to ride smoothness and crisp steering.

Chevy Express Cargo and Passenger Vans are manufactured at the General Motors assembly plant in Wentzville, Missouri.

### Engines

#### Vortec 4300 V6 SFI (L35)



The Vortec 4300 V6 SFI engine offers efficient performance in both conversion and cargo vans. It is standard on 1500 models.

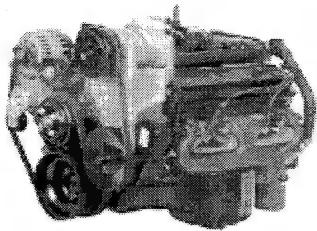
#### Power Ratings For The Vortec 4300 V6:

- 200 horsepower at 4400 rpm
- 250 lb.-ft. of torque at 2800 rpm.

#### Vortec 4300 V6 Engine Technical Features Include:

- **NEW** The Vortec V6 engine features new roller rocker arms, a new roller timing chain and a new powdered metal sprocket. These components help provide quieter operation and extended durability
- Sequential Fuel Injection (SFI)
- Gear-driven balance shaft helps provide smooth engine performance
- Tuned, two-piece intake manifold helps provides excellent engine breathing for added engine power
- Special cam profile delivers plenty of low-speed torque for trailering, while extending and flattening the torque curve
- Roller lifters are designed to help reduce internal engine friction by incorporating small rollers where they contact the camshaft, resulting in increased engine durability
- Steel camshaft helps withstand the higher contact stresses associated with roller lifters
- Efficient cooling system
- Low maintenance due to platinum-tip spark plugs which can go up to 100,000 miles before the first scheduled replacement\* and extended-life engine coolant that lasts up to five years or 150,000 miles, whichever comes first.\*

### **Vortec 5700 V8 SFI Engines (L31)**



The small block V8 Vortec 5000 (L30) and 5700 (L31) truck engines give Chevy Express Passenger and Cargo Van owners more of what they want: hardworking horsepower and torque, and longer intervals between recommended service than engines from just a few years ago. The Vortec 5000 is optional on Chevy Express Passenger and Cargo Van under 8,600 lb. GVWR. The Vortec 5700 is optional on Chevy Express Passenger and Cargo Van 1500 models, and standard on all 3500 models.

#### **Power Ratings For The Vortec 5000:**

- 220 horsepower at 4600 rpm
- 280 lb.-ft. of torque at 2800 rpm.

#### **Power Ratings For The Vortec 5700 Engine:**

- 255 horsepower at 4600 rpm (250 horsepower at 4200 rpm on vehicles with 10,000 lbs. GVWR or over)
- 330 lb.-ft. of torque at 2800 rpm

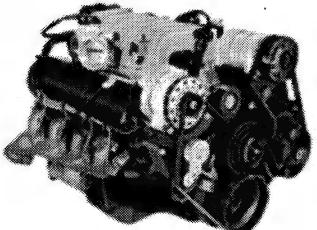
#### **Power Ratings For The Vortec 5700 (On Models With Gvwr Above 10,000 Lbs.):**

- 245 horsepower at 4200 rpm
- 330 lb.-ft. of torque at 2800 rpm.

#### **Both Engines Feature The Following Technical Features:**

- Cylinder heads with straight port design helps provide optimum breathing ability. This cylinder head features a compression ratio that demonstrates thermal efficiency and performance, but does not require higher octane ratings
- Durable valvetrain design uses a steel camshaft to handle stress over the life of the engine. Roller lifters help aid durability by reducing friction
- Low maintenance due to platinum-tip spark plugs which can go up to 100,000 miles before the first scheduled replacement\* and extended-life engine coolant that lasts up to five years or 150,000 miles, whichever comes first.\*

### **Vortec 5700 V8 SFI Engines (L31)**



The Vortec 7400 (L29) big block V8 engine provides impressive horsepower and torque output. It is optional on Chevy Express Cargo Van G3500 models and Chevy Express G3500 models.

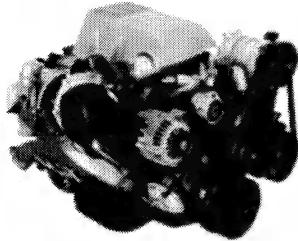
### **Power Ratings For The Vortec 7400 Engine:**

- 290 horsepower at 4000 rpm
- 410 lb.-ft. of torque at 3200 rpm.

### **Vortec 7400 Engine Technical Features:**

- Sequential Port Fuel Injection is designed to provide an efficient fuel-delivery method that aids cold starts and hot engine restart. By placing a separate fuel injector in the intake manifold for each cylinder, the fuel delivery is very precise. This results in high power output that optimizes fuel economy
- Cylinder heads feature high-flow ports for maximum breathing ability. High-swirl, fast-burn combustion chambers and computer-designed pistons provide a 8.9:1 compression ratio, which helps demonstrate thermal efficiency and performance, but does not require fuel with a higher octane rating
- Two-piece aluminum intake manifold
- Low maintenance\*
- Single accessory drive belt.

### **6.5 Liter Indirect EFI V8 Turbo-Diesel Engines (L65)**



The 6.5-Liter Turbo-Diesel V8 engine is optional on Chevy Express Cargo Van G2500 and G3500 and Chevy Express Passenger Van G2500 and G3500 models with GVWRs starting at 8,600 lbs. (except on Chevy Express G2500 Extended Wheelbase).

### **Power Ratings For The 6.5 Liter Turbo-Diesel Engine:**

- 195 horsepower at 3400 rpm
- 430 lb.-ft. of torque at 1800 rpm (automatic)

### **6.5 Liter Turbo-Diesel Engine Technical Features:**

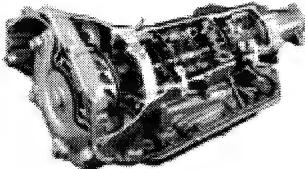
- Completely integrated turbocharger system with:
  - An electronically controlled Borg Warner/IHI turbocharger designed for quick response during acceleration
  - A waste gate on the exhaust side of the turbocharger to reduce boost pressure after maximum torque is obtained, thereby helping to reduce stress on the internal engine components
  - 10 psi maximum boost at 1800 rpm, helping to deliver responsive acceleration on demand without noticeable turbo-lag.
- The engine is designed to withstand the stress of turbocharging, contributing to a long life of dependable service. Among the design features are a strengthened bulkhead area of the cylinder block and larger coolant passages and oil galleries to help provide the flow needed for proper cooling and lubrication
- Combustion chamber design ensures even and complete fuel burning by optimizing the ratio of air and fuel in the prechamber, combustion chamber and cylinder. This helps engine efficiency.
- Piston spray cooling showers the bottoms of the pistons with oil for cooling and lubrication that helps promote long engine life

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- Large diameter oil cooler lines
- Indirect Electronic Fuel Injection system and an electronic throttle control design — the first application of this technology in the full-size pickup segment. Electronic control reduces the number of moving parts which helps increase reliability. Benefits of the indirect Electronic Fuel Injection design include:
  - Increased fuel economy over comparable mechanical fuel injection system
  - Virtual elimination of white smoke during cold-starting and black smoke under hard acceleration
  - Improved cold-starting
  - Enhanced idle quality and lower noise
  - Engine overheating protection
  - Fuel-management system incorporates a double filter, a water separator and a fuel heater in one canister. The fuel heater helps to substantially reduce exhaust smoke during cold start-ups
  - Efficient engine cooling
  - Molded 9-blade composite fan contributes to quiet operation.
- Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

## Transmissions

### 4L60-E 4-Speed Electronically Controlled Automatic Transmission

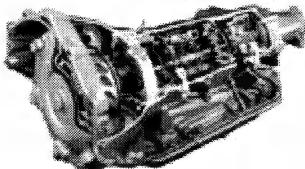


The GM 4L60-E 4-speed automatic transmission with overdrive is standard on all Chevy Express Passenger and Cargo Van models with a GVWR of less than 8,600 lbs. The 4L60-E's "intelligent" electronic controls allow the transmission to match the engine's performance, helping achieve fuel efficiency.

#### 4L60-E Transmission Features Include:

- Two-piece case contributes to powertrain stiffness, resulting in reduced vibration and noise over a three-piece design
- Deep oil pan helps cool transmission oil for extended transmission life
- Wide range of gear ratios
- Powertrain Control Module (PCM) measures key vehicle input, including throttle position, vehicle speed, gear range, temperature and engine load. Shift points and shift smoothness are controlled by four solenoids that are connected to the PCM
- Electronically controlled converter clutch allows gradual engagement of the torque converter clutch for smooth driveability, while helping to aid fuel economy
- Electronic line pressure scheduling software adjusts pressure to the clutch, based on the torque output of the engine for a smooth, consistent shift feel
- Second-gear start feature helps provide an extra measure of control in hazardous driving conditions. By moving the gear selector to the Drive 2 position, the driver can reduce torque to the drive wheels, increasing control during initial acceleration on slippery surfaces
- Brake/transmission shift interlock, included with all Chevy Express Passenger and Cargo Van transmissions, requires the driver to apply the brake pedal to shift out of PARK
- Long-life automatic transmission fluid will not need to be replaced for at least 100,000 miles under normal operating conditions.\*

### 4L80-E 4-Speed Electronically Controlled Automatic Transmission



The heavy-duty 4L80-E electronically controlled 4-speed automatic transmission with overdrive is standard on models with GVWRs of 8,600 lbs. and above. The rugged 4L80-E has a maximum engine torque rating of 440 lb.-ft.

#### 4L80-E Technical Features Include:

- Wide range of gear ratios
- Precise and flexible electronic controls
- Electronic line pressure scheduling software adjusts pressure to the clutches based on the torque output of the engine contributing to smoother, more consistent shift feel

- Electronically controlled converter clutch
- Efficient transmission cooler lines
- Contoured bottom pan
- Bottom pan drain plug helps make the transmission easy to service. No longer does the entire pan have to be removed to drain the transmission fluid
- Torque converter is specially designed to enhance initial acceleration. The converter's lockup clutch helps improve fuel economy by reducing slippage at cruising speeds. A converter damper makes the application and release of the lockup feature less perceptible
- Brake/transmission shift interlock
- Transmission fluid will not need to be replaced for at least 50,000 miles under normal operating conditions.\*

\* Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

## **Suspension**

### **Front**

Independent Short/Long Arm (SLA) suspension with stabilizer bar equips the front of every Chevy Express and Chevy Express Cargo Van model. The SLA suspension helps the front wheels step over bumps for a stable ride and control, and keeps the tires in contact with the road for minimal tire wear and good traction.

### **Rear**

Variable-rate, two-stage, multi-leaf springs are standard on the rear suspension. The longer set of leaves provide a smooth ride when the vehicle is light on cargo. As additional passengers and cargo are loaded, the longer leaves flatten out and the shorter, stiffer leaves deliver additional support.

## **Steering**

Power steering is standard on all Chevy Express and Chevy Express Cargo Van models.

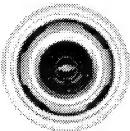
## **Brakes**

- 4-wheel antilock brake system (ABS) is standard.
- Power front disc/rear drum brakes are standard on Chevy Express Passenger and Cargo Van models as the foundation braking system. The large, ventilated front rotors help improve brake cooling. Audible pad-wear sensors are designed to alert the driver when brake-pad maintenance is needed.

## Wheels And Tires

### Wheels

#### Passenger Van:



Argent steel wheel with black center cap on Base models (G1500 Series has 15" x 6" wheels, G2500 and G3500 Series have 16" x 6.5" wheels) Standard.

#### Cargo Van:

Argent steel wheel with black center cap (G1500 Series has 15" x 6" wheels, G2500 and G3500 Series have 16" x 6.5" wheels) Standard.

#### Passenger Van:



Argent steel wheel with chrome center cap and trim ring on LS models. Standard (optional on Base models).

#### Cargo Van:

16" x 6.5" argent steel wheel with bright center cap and trim ring. Optional.

#### Passenger Van:



15" x 6" cast-aluminum wheel Optional on G1500 Series only; both trim levels.

#### Cargo Van:

15" x 6" cast-aluminum wheel Optional on G1500 with YF7 Upfitter Package only.

### Tires

- P235/75R-15 blackwall tires are standard on Chevy Express G1500 and Chevy Express Cargo Van 1500 (except on Chevy Express Cargo Van G1500 with 6100 lb. GVWR. On these models the standard tire is P215/70R15 blackwall tires). Whitewall or white outline-lettered tires optional on Express Passenger Vans
- LT225/75R-16E tires are standard on Chevy Express G2500 and Chevy Express Cargo Van G2500 (except on Chevy Express Cargo Van G2500 with 7300 lb. GVWR. On these models the standard tire is LT225/75R-16D blackwall)
- LT245/75R-16E tires (standard on Chevy Express G3500 and Chevy Express Cargo Van G3500).

**Feature Availability**

	Chevy Express	Chevy Express LS	Chevy Express Cargo Van
<b>Interior</b>			
Air bags - dual	S	S	S
Air conditioning - front, with CFC-free refrigerant	S	S	O
- front and rear	O	O	O <sup>1</sup>
Convenience group - power door locks and windows	O	S	O
- Tilt-Wheel& steering column and cruise control	O	S	O
Defogger - rear	O	O	O
Door beams - side impact	S	S	S
Floor covering - embossed black vinyl	S	NA	S
- carpeting	NA	S	NA
Gauges - fuel level, odometer, oil pressure, speedometer, temperature gauge, trip odometer, voltmeter	S	S	S
Lights, Interior - three dome	S	S	NA
- two dome	NA	NA	S
Power outlet - single, covered	S	S	S
Seating - 2 passenger	NA	NA	S
- 8 passenger	S <sup>2</sup>	S <sup>2</sup>	NA
- 5 passenger	O <sup>2</sup>	O <sup>2</sup>	NA
- 12 passenger	O <sup>2</sup>	O <sup>2</sup>	NA
- 15 passenger	O <sup>2</sup>	O <sup>2</sup>	NA
Seats - vinyl front buckets	NA	NA	S
- vinyl front reclining buckets and two bench	S	NA	NA
- Custom Cloth front reclining buckets and two bench	O <sup>2</sup>	S <sup>2</sup>	NA
Steering wheel - black four-spoke	S	S	S
- black leather-wrapped	O	O	NA
Stereo - ETR AM/FM stereo with seek-scan and digital clock	S	S	S
- ETR AM/FM stereo with cassette player, seek-scan and digital clock	O	O	O
- ETR AM/FM stereo with compact disc player, seek-scan and digital clock	O	O	NA
- ETR AM/FM stereo with cassette and compact disc players, seek-scan and digital clock	O	O	O
Sunshades - vinyl-covered, color-keyed	NA	NA	S
- cloth w/lighted mirrors	S	S	NA
Warning tone - headlamps-on warning buzzer	S	S	S
Wipers - intermittent variable	S	S	S
<b>Exterior</b>			
Daytime Running Lamps	S	S	S
Doors - RH and LH rear loading	S	S	S
- side 60/40	S	S	S
- side sliding (no charge option)	O	O	O
Mirrors - LH and RH direct control foldaway, black	S	S	S

## 2000 Chevrolet Express Van Restoration Kit

- electric remote control, w/defog.	O	O	O
Wheels- steel 15" x 6" painted silver w/black center cap	S	NA	S
- with bright center cap and trim ring	O	S	O
- brushed aluminum 15" x 6"	O <sup>3</sup>	O <sup>3</sup>	O <sup>4</sup>

### Functional

Brakes - 4-wheel antilock	S	S	S
- power, front disc/rear drum	S	S	S
Cargo capacity - 267.3 to 316.8 cu. ft. <sup>5</sup>	S	S	S
Engine - Vortec 4300 V6 SFI	S	S	S
- Vortec 5000 V8 SFI	O	O	O
- Vortec 5700 V8 SFI	O <sup>6</sup>	O <sup>6</sup>	O <sup>6</sup>
- Vortec 7400 V8 SFI	O <sup>7</sup>	O <sup>7</sup>	O <sup>7</sup>
- 6.5L Turbo-Diesel V8 IDI	O <sup>8</sup>	O <sup>8</sup>	O <sup>8</sup>
Remote Keyless Entry	NA	O	NA
Transmission - 4-speed electronically controlled automatic	S <sup>9</sup>	S <sup>9</sup>	S <sup>9</sup>

S — Standard.

O — Optional (some options may be available only as part of a Preferred Equipment Group or in combination with certain models or equipment).

NA — Not available.

1 Except on Chevy Express Van with RPO YF7 Upfitter Package.

2 5-passenger seating optional on G1500 only; 8-passenger seating standard on G1500, optional on G2500 and G3500 Regular Wheelbase model; 12-passenger seating standard on G2500 and G3500 Regular Wheelbase and Extended Wheelbase models; 15-passenger seating optional on G3500 Extended Wheelbase only.

3 Available on G1500 Regular Wheelbase Chevy Express only.

4 Available only on Chevy Express Van with RPO YF7 Upfitter Package.

5 Maximum cargo capacity for Regular Wheelbase models — 267.3 cu. ft.; for Extended Wheelbase models — 316.8 cu. ft.

6 Standard in models over 8,600 lbs. GVWR.

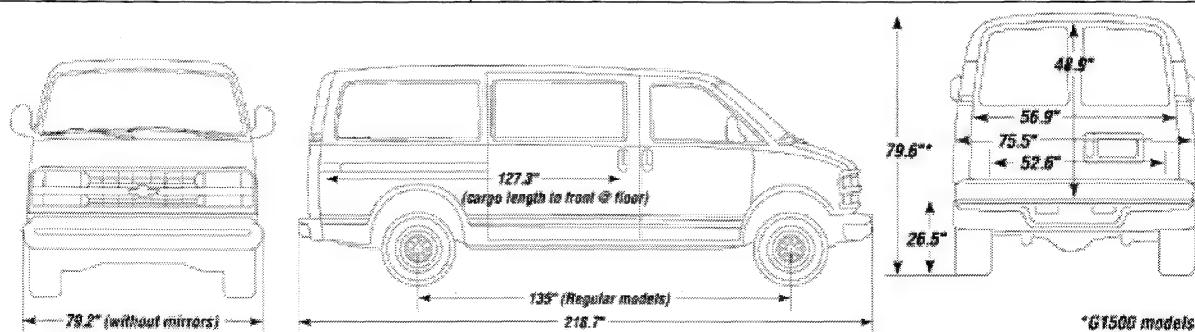
7 Available in G3500 model only. Heavy-duty transmission required.

8 Chevy Van G2500 and G3500, and Chevy Express G2500 Regular Wheelbase and G3500 models only.

9 4L60-E transmission with GVWRs below 8,600 lbs.; 4L80-E heavy-duty transmission with GVWRs at or above 8,600 lbs.

### Specifications

Model Availability					
	G1500 Regular	G2500 Regular	G2500 Extended	G3500 Regular	G3500 Extended
Passengers (std./opt.) - Chevy Express	2/1	2/1	2/1	2/1	2/1
Cargo					
Passengers (std./opt.) - Chevy Express Pass.	8/5	12/8	12/-	12/8	12/15
Class	Large Van				
Assembly plant	Wentzville, Missouri				





**Dimensions & Capacities**

Exterior Dimensions	G1500 Regular			G2500 Regular			G2500 Extended			G3500 Regular			G3500 Extended		
	U. S. Standard	Metric	U. S. Standard	Metric	U. S. Standard	Metric	U. S. Standard	Metric	U. S. Standard	Metric	U. S. Standard	Metric	U. S. Standard	Metric	
Wheelbase(in.)	135.0	3429mm	135.0	3429mm	155.0	3937mm	135.0	3429mm	155.0	3937mm	155.0	3937mm	155.0	3937mm	
Overall length(in.)	218.7	5555mm	218.7	5555mm	238.7	6063mm	218.7	5555mm	238.7	6063mm	238.7	6063mm	238.7	6063mm	
Overall height(in.)	79.6	2021mm	82.5	2099mm	81.1	2060mm	83.9	2131mm	82.5	2096mm	82.5	2096mm	82.5	2096mm	
Maximum width(in.)	79.4	2017mm	79.2	2012mm	79.2	2012mm	79.4	2017mm	79.2	2012mm	79.2	2012mm	79.2	2012mm	
Ground to rear load floor(in.)	24.3	617mm	27.4	696mm	27.7	704mm	29.0	737mm	29.0	737mm	29.0	737mm	29.0	737mm	
Ground clearance front(in.)	7.4	188mm	8.2	208mm	8.1	206mm	8.7	221mm	8.7	221mm	8.7	221mm	8.7	221mm	
Ground clearance rear(in.)	7.2	183mm	8.0	203mm	8.0	204mm	8.5	216mm	8.5	216mm	8.5	216mm	8.5	216mm	
Curb weight (std.) (lbs.)Passenger Van/Cargo Van	5142/ 4660	2333/ 2114 kg	5823/ 4850	2641/ 2200 kg	6045/ 5052	2724/ 2292 kg	5987/ 5387	2716/ 2444 kg	6208/ 5589	2816/ 2536 kg	6208/ 5589	2816/ 2536 kg	6208/ 5589	2816/ 2536 kg	
GWR (lbs.) Passenger/Cargo	6100-7100/ 7100	2767-3221/ 3221 kg	7300-8600/ 8600	3312-3901/ 3901 kg	7300-8600/ 8600	3312-3901/ 3901 kg	9500/ 9500	4310/ 4310 kg							
Payload @ Base GVWR (lbs.) Passenger/Cargo	1934	721 kg	2743	1023 kg	2756/ 2248	1028/ 1020 kg	3504/ 4113	1307/ 1866 kg	3296/ 3911	1500/ 1775 kg	3296/ 3911	1500/ 1775 kg	3296/ 3911	1500/ 1775 kg	
Cargo volume - rear seats removed (cu. ft.)	267.3	7589.4 liters	267.3	7589.4 liters	316.8	8994.8 liters	267.3	7589.4 liters	316.8	8994.8 liters	316.8	8994.8 liters	316.8	8994.8 liters	
Max. trailer capacity (lbs.)	6500	2949 kg	8000	3629 kg	8000	3629 kg	10,000	4536 kg	10,000	4536 kg	10,000	4536 kg	10,000	4536 kg	
Turning diameter (curb) (ft.)	45.2	13.8 m	47.4	14.4 m	53.4	16.3 m	47.5	14.5 m	53.5	16.3 m	53.5	16.3 m	53.5	16.3 m	
Interior Dimensions	40.6	1031mm	40.6	1031mm	40.6	1031mm	40.6	1031mm	40.6	1031mm	40.6	1031mm	40.6	1031mm	
Headroom (middle seats - 1st row/2nd row) (in.)	39.0/39.1	991/993mm	39.0/39.1	997/993mm	39.0/39.1	991/994mm	39.0/39.1	991/994mm	39.0/39.1	991/993mm	39.0/39.1	991/993mm	39.0/39.1	991/993mm	
Headroom (rear) (in.)	39.2	996mm	39.2	996mm	39.2	996mm	39.2	996mm	39.2	996mm	39.2	996mm	39.2	996mm	
Legroom (front) (in.)	41.1	1044mm	41.1	1044mm	41.1	1044mm	41.1	1044mm	41.1	1044mm	41.1	1044mm	41.1	1044mm	
Legroom (middle seats - 1st row/2nd row) (in.)	38.5/38.5	-	38.5/38.5	-	38.5/38.5	-	38.5/38.5	-	38.5/38.5	-	38.5/38.5	-	38.5/38.5	-	
Legroom (rear) (in.)	-	-	35.4	899mm	36.2	920mm	35.4	899mm	36.2	920mm	36.2	920mm	36.2	920mm	
Shoulder room (front) (in.)	68.8	1748mm	68.8	1748mm	68.8	1748mm	68.8	1748mm	68.8	1748mm	68.8	1748mm	68.8	1748mm	
Shoulder room (middle seats - 1st row/2nd row) (in.)	57.6/57.4	1463/1458m	57.6/57.4	1463/1458m	57.6/57.4	1463/1458m	57.6/57.4	1463/1458m	57.6/57.4	1463/1458m	57.6/57.4	1463/1458m	57.6/57.4	1463/1458m	
Shoulder room (rear) (in.)	-	62.2	1580mm	61.2	1555mm	62.2	1580mm	61.2	1580mm	61.2	1555mm	61.2	1555mm	61.2	1555mm
Hip room (front) (in.)	63.8	1621mm	63.8	1621mm	63.8	1621mm	63.8	1621mm	63.8	1621mm	63.8	1621mm	63.8	1621mm	
Hip room (middle seats: 1st row/2nd row) (in.)	55.5/56.1	1410/1425m	55.5/56.2	1410/1425m	55.5/55.5	1410/1410m	55.5/56.1	1410/1425m	55.5/55.5	1410/1425m	55.5/55.5	1410/1410m	55.5/55.5	1410/1410m	
Hip room (rear) (in.)	-	68.9	1750mm	68.9	1750mm	68.9	1750mm	68.9	1750mm	68.9	1750mm	68.9	1750mm	68.9	1750mm
Fuel tank Capacity (gallons)	31	117 liters	31	117 liters	31	117 liters	31	117 liters	31	117 liters	31	117 liters	31	117 liters	

2000 Chevrolet Express Van Restoration Kit

<b>Steering</b>					
<b>All models</b>					
Type	Integral power				
Steering ratio	17.2:1				
Turning diameter, Curb-to-curb (ft./m) Passenger/Cargo	G1500 Reg. Wheelbase 45.2/45.1- 13.7/13.7	G2500 Reg. Wheelbase 47.4/45.2- 14.4/13.7	G2500 Ext. Wheelbase 53.4/53.4- 16.3/16.3	G3500 Reg. Wheelbase 47.5/47.5- 14.5/14.5	G3500 Ext. Wheelbase 53.5/53.5- 16.3/16.3 m
<b>Brakes</b>					
<b>All models</b>					
Type	Power-assist, front disc/rear drum with 4-wheel ABS				
Parking brake	Cable to rear wheels				
<b>Gasoline Engines</b>					
RPO	L35	L30	L31	L29	
Type	Vortec 4300 OHV V6	Vortec 5000 OHV V8	Vortec 5700 OHV V8	Vortec 7400 OHV V8	
Block material	Cast iron	Cast iron	Cast iron	Cast iron	
Cylinder head material	Cast iron	Cast iron	Cast iron	Cast iron	
Bore & stroke (in.) (mm)	4.00 x 3.48 101.60 x 88.39	3.74 x 3.48 95.00 x 88.39	4.00 x 3.48 101.60 x 88.39	4.25 x 4.00 107.95 x 101.60	
Displacement (cu. in./cc)	262/4300	305/5012	350/5733	454/7439	
Compression ratio	9.2:1	9.4:1	9.4:1	8.9:1	
Induction system	SFI	SFI	SFI	SFI	
Valves/cylinder	2	2	2	2	
Lifters	Hydraulic roller	Hydraulic roller	Hydraulic roller	Hydraulic roller	
Cam drive	Chain	Chain	Chain	Chain	
Horsepower/kW @ RPM (SAE net)	200 @ 4400/149 kW @ 4400	220 @ 4600/164 kW @ 4600	255 @ 4600/190 kW @ 4600	290 @ 4000/216 kW @ 4000	
Torque/N·m @ RPM (SAE net)	250 @ 2800/339 N·m @ 2800	280 @ 2800/380 N·m @ 2800	330 @ 2800/447 N·m @ 2800	410 @ 3200/556 N·m @ 3200	
Redline (RPM)	5600	5600	5600	5600	
Recommended fuel (min.)	Reg. unleaded	Reg. unleaded	Reg. unleaded	Reg. unleaded	
<b>Engine Availability</b>					
<b>Chevy Express Passenger Van</b>					
G1500 RegularWheelbase	S	O	O	-	
G2500 RegularWheelbase	-	-	S	-	
G2500 ExtendedWheelbase	-	-	S	-	
G3500 RegularWheelbase	-	-	S	O	
G3500 ExtendedWheelbase	-	-	S	O	
<b>Chevy Express Cargo Van</b>					
G1500 RegularWheelbase	S	O	O	-	
G2500 RegularWheelbase	S	O	O	-	
G3500 RegularWheelbase	S	O	O	-	
G3500 ExtendedWheelbase	-	-	S	O	
<b>Transmission Availability</b>					
4-speed OD Automatic	S (M30)	S (M30)	S2 (M30/MT1)	S (MT1)	

S - Standard.

O - Optional.

1 Standard on this model equipped with RPO YF7 Upfitter Package for conversion vans.

2 An RPO M30 4L60-E electronically controlled automatic transmission is used in models with GVWRs below 8,600 lbs. (3901 kg); RPO MT1 4L80-E heavy-duty electronically controlled automatic is used in models with GVWRs at or above 8,600 lbs. (3901 kg).

## 2000 Chevrolet Express Van Restoration Kit

<b>Diesel Engine</b>	
Type	L65
Type/Block material	6.5L OHV V8
Cylinder head material	Cast iron
Bore & stroke (in./mm)	Cast iron 4.06 x 3.82/ 103.00 x 97.03
Displacement (cu. in./cc)	395/6468
Compression ratio	20.2:1
Induction system	Indirect EFI
Valves/cylinder	2
Lifters	Hydraulic roller
Cam drive	Chain
Horsepower/kW @ RPM (SAE net)	195 @ 3400/145 kW @ 3400
Torque/N-m @ RPM (SAE net)	430 @ 1800/522 N-m @ 1800
Redline (RPM)	3400

### Engine Availability

#### Chevy Express Passenger and Cargo Van (including Converter Package)

G2500 Regular Wheelbase	O
G2500 Extended Wheelbase	O
G3500 Regular Wheelbase	O
G3500 Extended Wheelbase	O

### Transmission availability

4-speed OD automatic <sup>1</sup>	S (MT1)
-----------------------------------	---------

S - Standard.

O - Optional.

1 An RPO MT1 4L80-E heavy-duty electronically controlled automatic is standard in all models equipped with a 6.5L Turbo-Diesel V8 engine.

### Transmissions

	G1500 and G2500 Regular Wheelbase and G2500 Extended Wheelbase Less than 8,600 lb. GVWR	G2500 at 8600 lb. GVWR G3500 Regular Wheelbase and G3500 Extended Wheelbase
	4-Speed electronic automatic with overdrive and torque converter (4L60-E)	Heavy-duty 4-speed automatic with overdrive and torque converter (4L80-E)
1st	3.06	2.48
2nd	1.63	1.48
3rd	1.00	1.00
4th	0.70	0.75
Reverse	2.29	2.08

### Chassis

Primary structure	All-steel integral, ladder-type frame
Body material	Two-sided galvanized steel
Frame	Full frame with isolated body-to-frame attachments
Front type	Independent, with computer-selected coil springs
Rear type	Semi-elliptic 2-stage multi-leaf springs

**Mileage & Performance (F1500/2500)\***

Powertrain	4-Speed automatic w/Vortec 4300 V6		4-Speed automatic w/Vortec 5000 V8		4-Speed automatic w/Vortec 5700 V8	
Mileage:	mpg	liters/100km	mpg	liters/100km	mpg	liters/100km
City	15	15.7	14	16.8	14	16.8
Highway	19	12.4	17	12.1	18	13.1
Combined	16	14.7	16	16.7	15	15.7
Est. cruising range:	mi.	km	mi.	km	mi.	km
City	465	748	434	698	434	748
Highway	589	948	527	861	558	898
Combined	496	798	496	779	465	748

\* Based on 1999 information. Fuel economy figures not published for vehicles with GVWR over 8,600 lbs.

**Trailering Information (G1500/2500)**

	Vortec 4300 V6 (G1500/G2500)	Vortec 5000 V8 (G1500/G2500)	Vortec 5700 V8 (G1500/2500)	6.5L Turbo-Diesel V8 (2500)
Trailer classification	Medium	Medium	Medium	Heavy
Max. trailer weight rating (lbs./kg, up to)*	4700-5700/2132-2449	5600-5800/2540-2630	6100-8300/2767-3765	8900/4037

**NOTE:** Trailer tongue weight should be 10 to 15 percent of total loaded trailer weight (up to 1,000 lbs.). Powertrain availability varies by series, model and GVWR selected. \*Maximum trailer weight ratings are based on Regular Wheelbase models and are calculated assuming a standard equipped base vehicle plus driver. Trailer ratings for Extended Wheelbase models will be reduced. The weight of optional equipment, passengers, cargo and required trailering equipment will also reduce the maximum trailer weight your truck can tow. See your Chevy Truck dealer for additional details.

**Trailering Information (G3500)**

	Vortec 5700 V8	6.5L Turbo-Diesel V8	Vortec 7400 V8	
Trailer classification	Medium	Heavy	Heavy	
Max. trailer weight rating (lbs./kg, up to)*	6600-8100/2974/3674	8800/4012	7900-10,000/3583- 4536	

**NOTE:** Trailer tongue weight should be 10 to 15 percent of total loaded trailer weight (up to 1,000 lbs.). Powertrain availability varies by series, model and GVWR selected. \*Maximum trailer weight ratings are based on Regular Wheelbase models and are calculated assuming a standard equipped base vehicle plus driver. Trailer ratings for Extended Wheelbase models will be reduced. The weight of optional equipment, passengers, cargo and required trailering equipment will also reduce the maximum trailer weight your truck can tow. See your Chevy Truck dealer for additional details.

**Wheels & Tires**

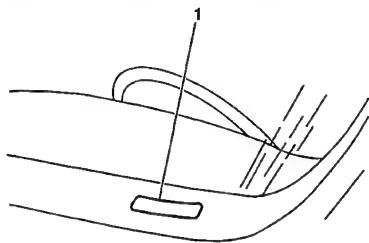
	G1500 Reg. Wheelbase	G2500 Reg. and Ext. Wheelbase	G3500 Reg. and Ext. Wheelbase	
Standard wheel type	Steel*	Steel	Steel	
Size (in.)	15 x 6	16 x 6.5	16 x 6.5	
Standard tire type	Steel-belted all-season radials	Steel-belted all-season radials	Steel-belted all-season radials	
Size	P235/75R-15	LT225/75R-16E	LT245/75R-16E	

\* Cast-aluminum wheels optional on G1500.

All specifications are preliminary and subject to change. Chevrolet Motor Division, June 1999.

## Vehicle Identification

### Vehicle Identification Number (VIN)



The vehicle identification number (VIN) plate is the legal identifier of the vehicle. The VIN plate is located on the upper LH corner of the Instrument Panel and can be seen through the windshield from the outside of the vehicle:

Position	Definition	Character	Description
1	Country of Origin	1	U.S.A.
2	Manufacturer	G	General Motors
3	Make	C,T	C - Chevrolet T - GMC Truck
4	GVWR/Brake System	B C D E F G H J K	B - 3001 - 4000/Hydraulic C - 4001 - 5000/Hydraulic D - 5001 - 6000/Hydraulic E - 6001 - 7000/Hydraulic F - 7001 - 8000/Hydraulic G - 8001 - 9000/Hydraulic H - 9001 - 10 000/Hydraulic J - 10 001 - 14 000/Hydraulic K - 14 001 - 16 000/Hydraulic
5	Truck Line/Chassis Type	G	G-Van 4X2 Chevrolet Express GMC Savana
6	Series	1,2,3	1 - 1 1/2 Ton 2 - 3/4 Ton 3 - 1 Ton
7	Body Type	0,1,5	0 - Chassis Only 1 - Cutaway Van 5 - Van
8	Engine Type	J,M,R,W,F	J - 7.4L MFI HO V8 (L29) M - 5.0L CPI V8 (L30) R - 5.7LCPI V8 (L31) W - 4.3L CPI V6 (L53) F - 6.5L V8 Diesel, Turbo (L65)
9	Check Digit	--	--
10	Model Year	Y	2000
11	Plant Location	1	Wentzville, MO
12-17	Plant Sequence Number	100,001	--
12-17	Plant Sequence Number	900,001	Pre-Assigned

## VIN Derivative

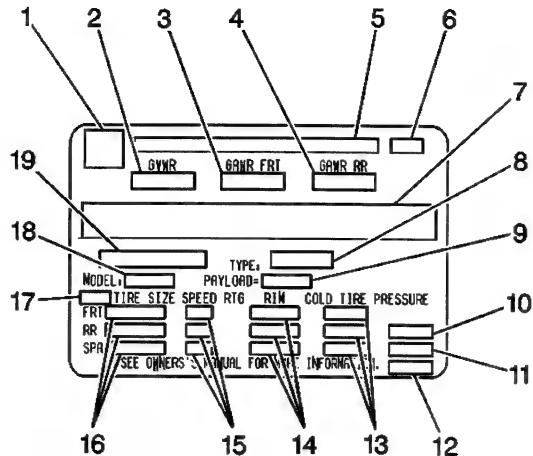
All engines and transmissions are stamped or laser etched with a partial vehicle identification number (VIN), which was derived from the complete VIN. A VIN derivative contains the following nine positions:

Position	Definition	Character	Description
1	GM Division Identifier	G	General Motors
2	Model Year	Y	2000
3	Assembly Plant	1	Wentzville MO
4-9	Plant Sequence Number	100,001	--
4-9	Plant Sequence Number	900,001	Pre-Assigned

A VIN derivative can be used to determine if a vehicle contains the original engine or transmission, by matching the VIN derivative positions to their accompanying positions in the complete VIN:

VIN Derivative Position	Equivalent VIN Position
1	2
2	10
3	11
4-5	12-17

**Label Certification w/o RPO Z49**



The vehicle certification label displays the following assessments:

- The Gross Vehicle Weight Rating (GVWR)
- The Gross Axle Weight Rating (GAWR) -- Front and Rear
- The vehicle's payload rating
- The original equipment tire sizes and the recommended tire pressures

Gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. Include the following items when figuring the GVW:

- The base vehicle weight (factory weight)
- The weight of all vehicle accessories, like the winches or the plows
- The weight of the driver and the passengers
- The weight of the cargo

The gross vehicle weight must not exceed the Gross Vehicle Weight Rating.

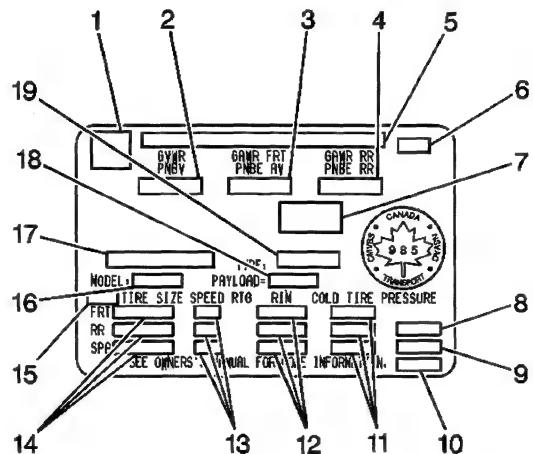
The front gross axle weight rating (GAWR FRT) is the weight exerted on the front axle. The rear gross axle weight rating (GAW RR) is the weight exerted on the rear axle. The front and rear gross axle weights must not exceed the front and rear gross axle weight ratings.

The payload rating defines the vehicle's maximum allowable cargo load. The cargo load includes the driver and the passengers. The payload rating is based on the vehicle's factory installed equipment. Deduct from the payload rating the weight of accessories added to the vehicle after the final date of manufacture.

The vehicle may have a Gross Combination Weight Rating (GCWR). The Gross Combination Weight Rating refers to the total maximum weight of the loaded tow vehicle (including driver and passengers) and a loaded trailer.

The vehicle's tires must be the proper size and properly inflated for the load the vehicle is carrying.

### Label Certification with RPO Z49



- (1) Logo
- (2) Gross Vehicle Weight Rating
- (3) Gross Axle Weight Rating - Front
- (4) Gross Axle Weight Rating - Rear
- (5) Name of Manufacturer
- (6) Final Manufacturer's Date
- (7) RFI Statement - Canada Only
- (8) DUAL - When Equipped
- (9) Front Axle Reserve - When Equipped
- (10) Total Capacity - When Required
- (11) Tire Pressure
- (12) Rim Size
- (13) Speed Rating - When Required
- (14) Tire Size
- (15) GVW Rating Code
- (16) Engineering Model
- (17) Vehicle Identification Number
- (18) Payload
- (19) Model Designation

## 2000 Chevrolet Express Van Restoration Kit

The vehicle certification label displays the following assessments:

- The Gross Vehicle Weight Rating (GVWR)
- The Gross Axle Weight Rating (GAWR) -- Front and Rear
- The vehicle's payload rating
- The original equipment tire sizes and the recommended tire pressures

Gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. Include the following items when figuring the GVW:

- The base vehicle weight factory weight
- The weight of all vehicle accessories, like the winches or the plows
- The weight of the driver and the passengers
- The weight of the cargo

The gross vehicle weight must not exceed the Gross Vehicle Weight Rating.

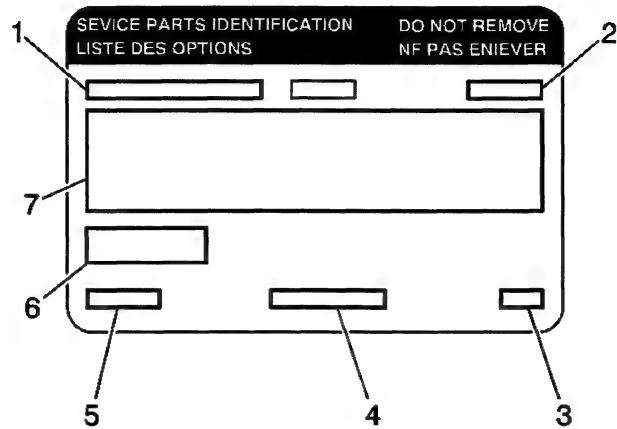
The front gross axle weight rating (GAWR FRT) is the weight exerted on the front axle. The rear gross axle weight rating (GAW RR) is the weight exerted on the rear axle. The front and rear gross axle weights must not exceed the front and rear gross axle weight ratings.

The payload rating defines the vehicle's maximum allowable cargo load. The cargo load includes the driver and the passengers. The payload rating is based on the vehicle's factory installed equipment. Deduct from the payload rating the weight of accessories added to the vehicle after the final date of manufacture .

The vehicle may have a Gross Combination Weight Rating (GCWR). The Gross Combination Weight Rating refers to the total maximum weight of the loaded tow vehicle including driver and passengers and a loaded trailer.

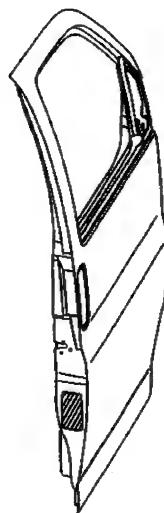
The vehicle tires must be the proper size and properly inflated for the load the vehicle is carrying.

### Service Parts Identification Label (SPID)



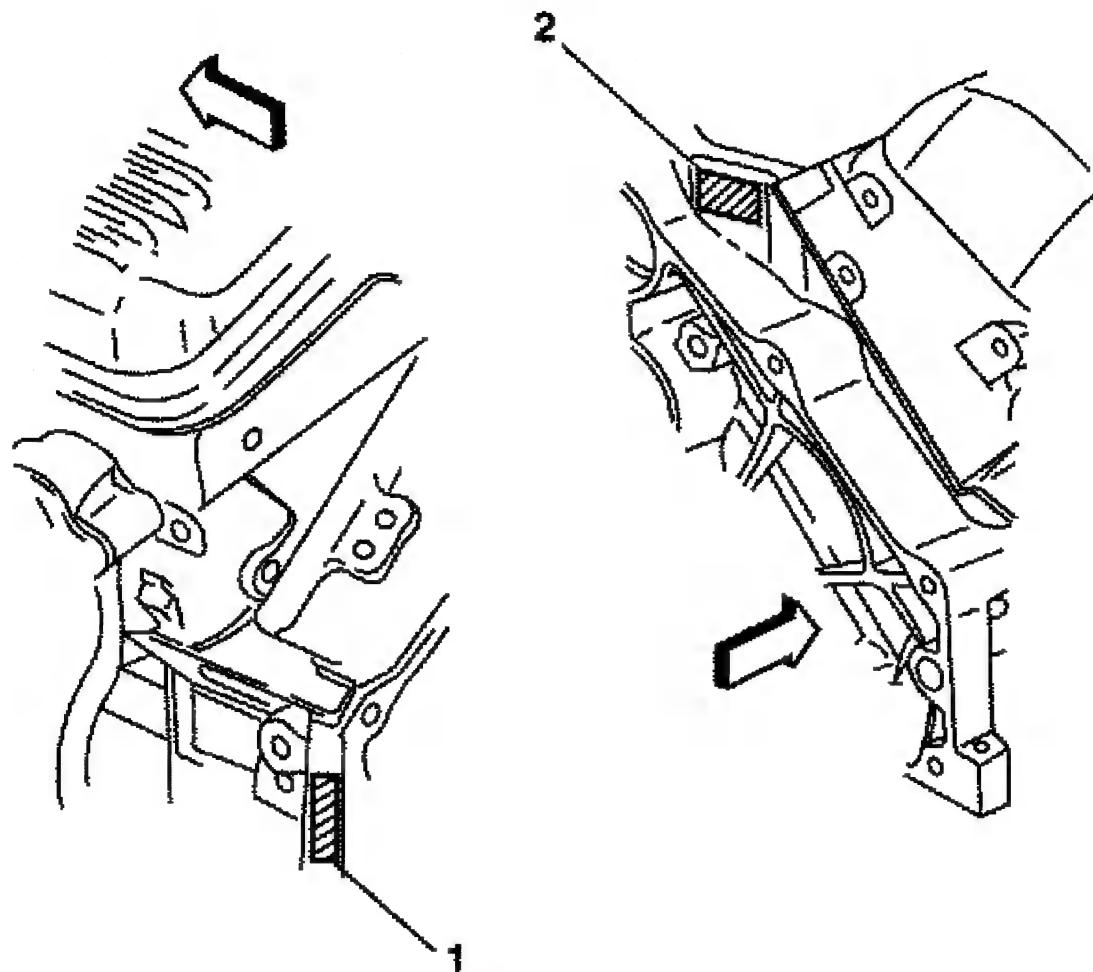
- (1) Vehicle Identification Number
- (2) Engineering Model Number (Vehicle Division, Vehicle Line and Body Style)
- (3) Interior Trim and Decor Level
- (4) Exterior (Paint Color) WA Number
- (5) Paint Technology
- (6) Special Order Paint Colors and Numbers
- (7) Vehicle Option Content

The service parts identification label is placed on the vehicle in order to help service and parts personnel identify the vehicle's original parts and the vehicle's original options.



The Service Information Parts ID label is located on the right front door of the vehicle.

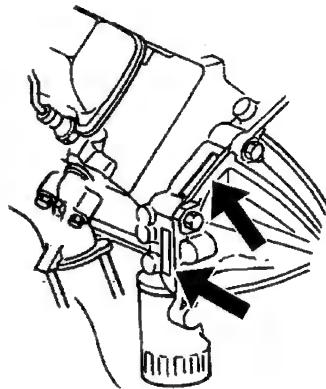
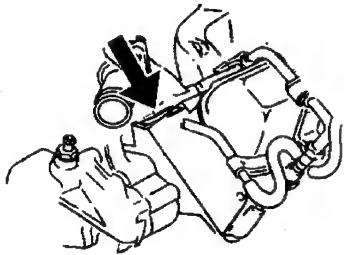
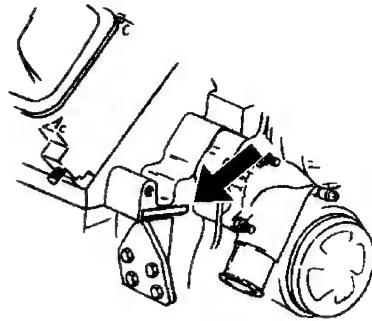
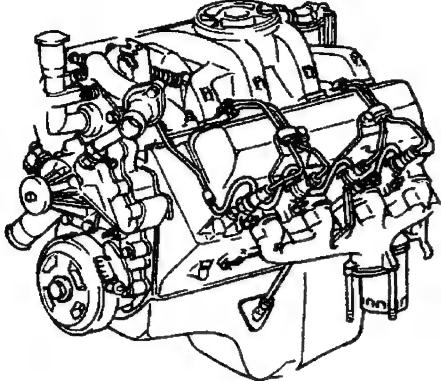
**Engine ID and VIN Derivative Location 4.3L**



- (1) Engine Identification Number
- (2) Alternative Engine Identification Number

Located on the VIN plate, the VIN provides detailed engine identification and code information by liter and by the engine code letter.

**Engine ID and VIN Derivative Location 6.5L Diesel**

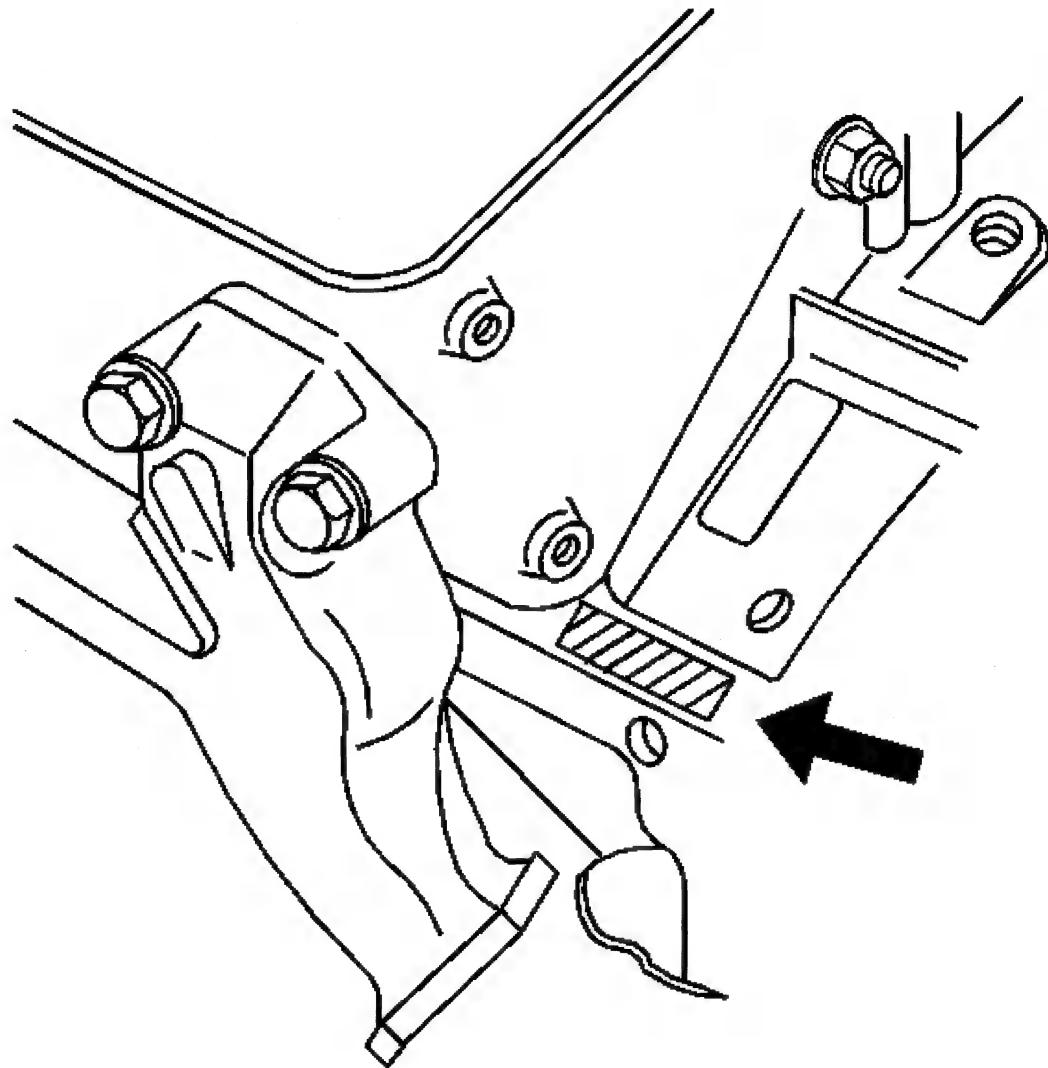


The engine unit number or date code is either laser etched or stamped into the engine block.

All engines are stamped with an eight digit engine identification number.

The 6.5L V-8 diesel engine VIN identification is located at the top left rear of the engine block.

**Engine ID and VIN Derivative Location 5.0L and 5.7L**

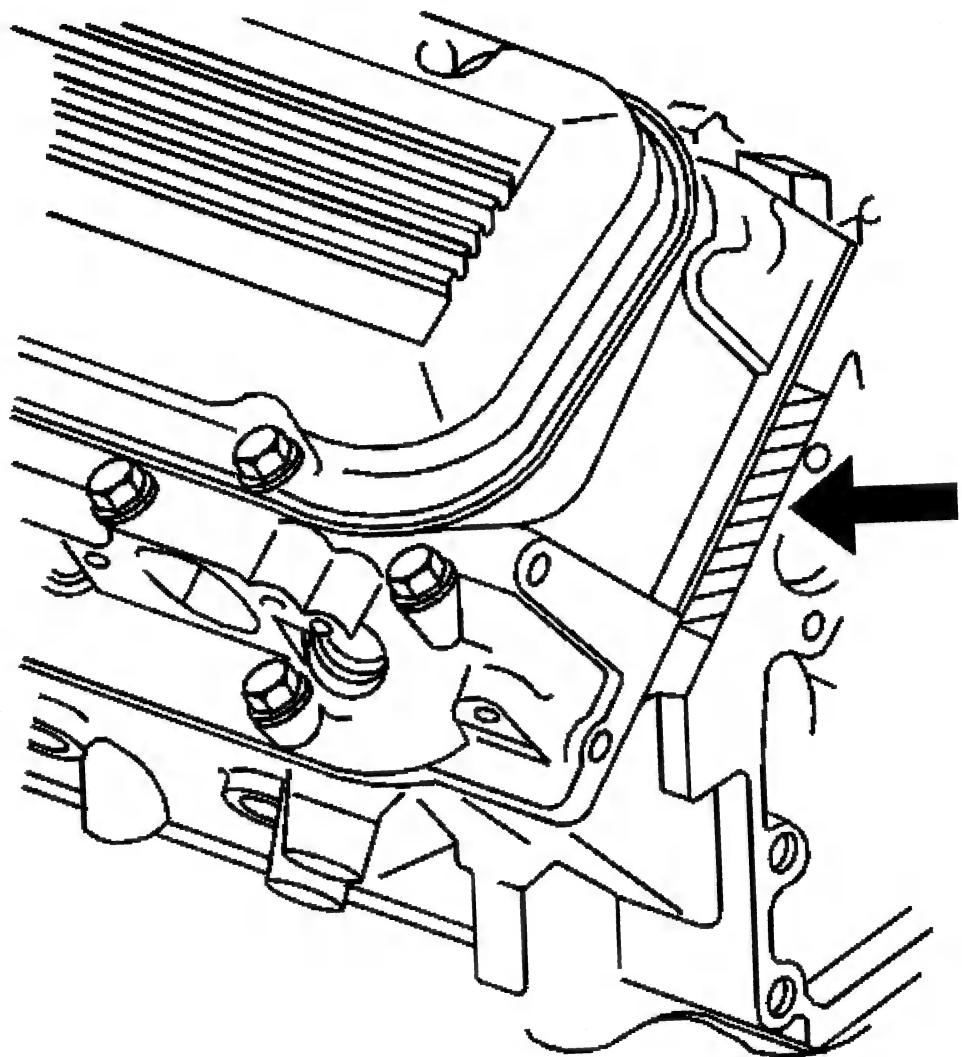


All engines are stamped with an eight digit engine identification number.

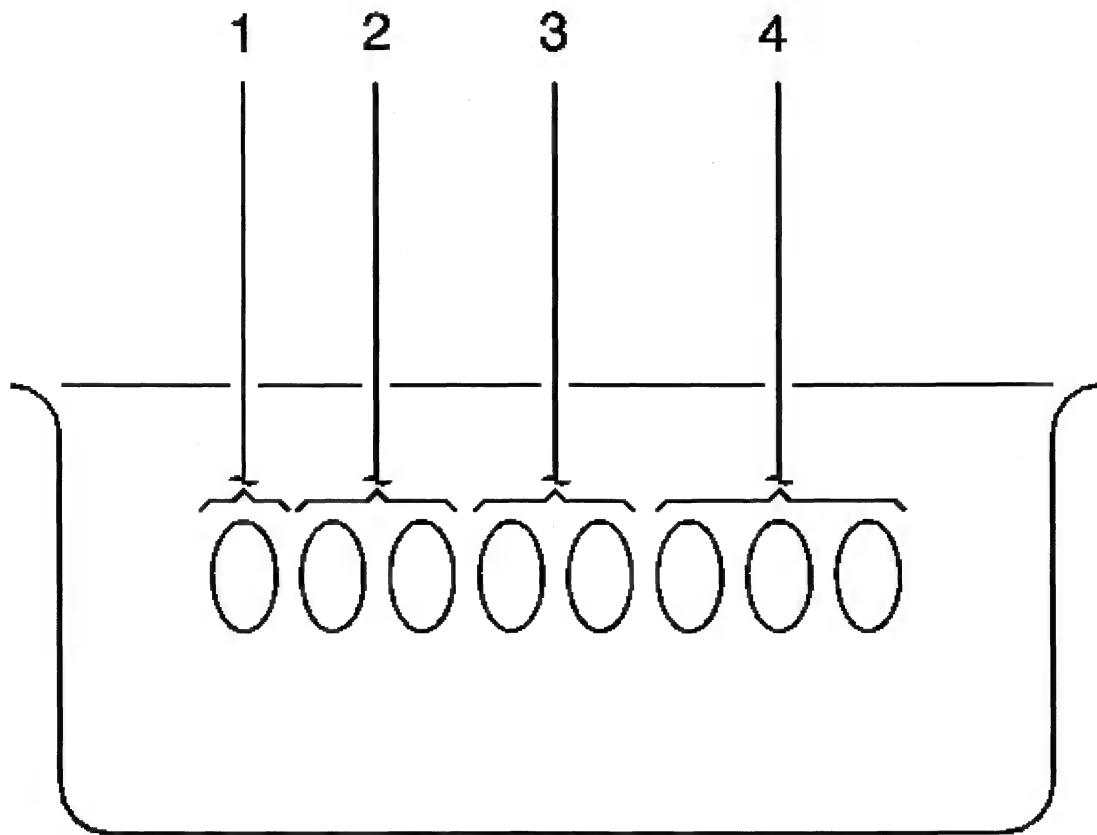
The Vehicle Identification Number (VIN) is located on the left side rear of the engine block (near the transmission bellhousing) and typically is a nine digit number stamped onto the engine at the vehicle assembly plant.

- The first digit identifies the division.
- The second digit identifies the model year.
- The third digit identifies the assembly plant.
- The fourth through ninth digits are the last six digits of the Vehicle Identification Number (VIN).

**Engine ID and VIN Derivative Location 7.4L**



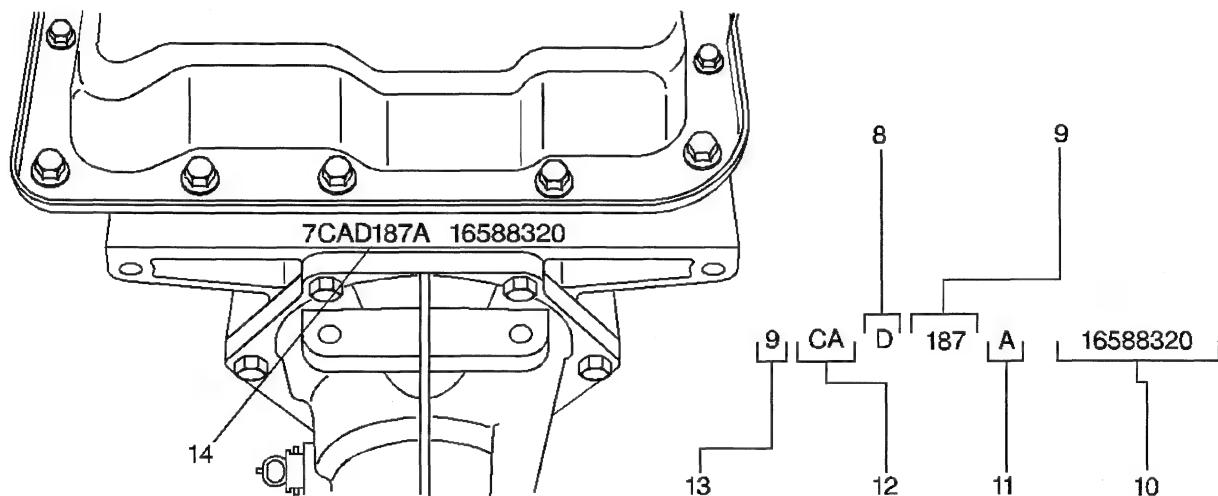
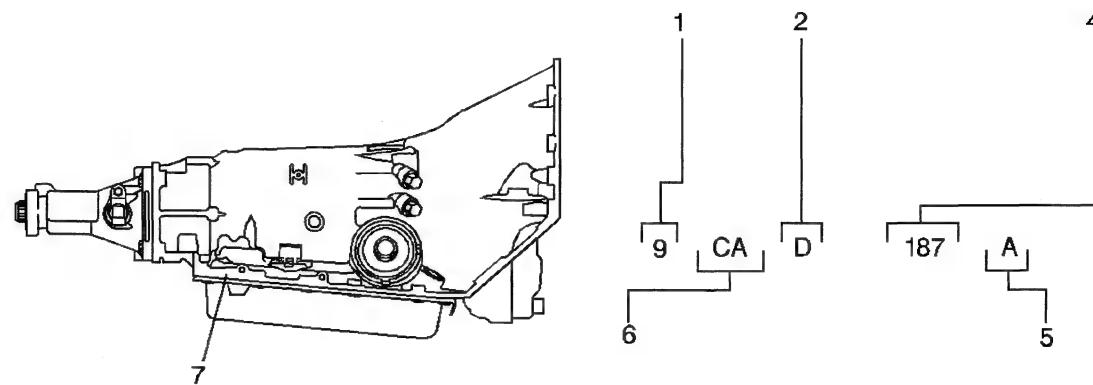
**Engine ID Legend**



1. Source Code
2. Month of Build
3. Date of Build
4. Broadcast Code

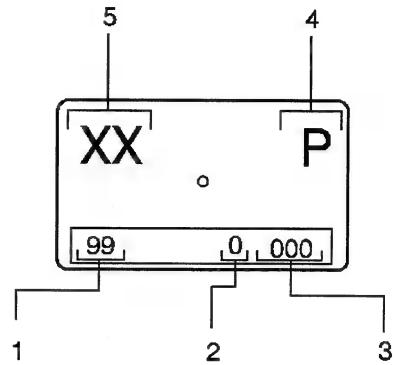
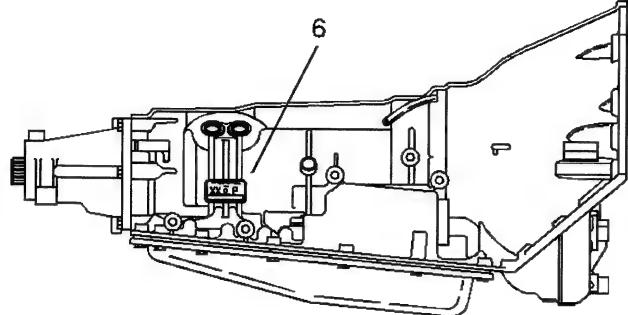
## Transmission ID and VIN Derivative Location

### 4L60-E Transmission ID Location



- (1) Model Year
- (2) Hydra-Matic 4L60-E
- (4) Julian Date (or Day of the Year)
- (5) Shift Built (A, B, J = First Shift; C, H, W = Second Shift)
- (6) Model
- (7) Transmission ID Location
- (8) Hydra-Matic 4L60-E
- (9) Julian Date (or Day of the Year)
- (10) Serial No.
- (11) Shift Built (A, B, J = First Shift; C, H, W = Second Shift)
- (12) Model
- (13) Model Year
- (14) Transmission ID Location

**4L80-E Transmission ID Location**

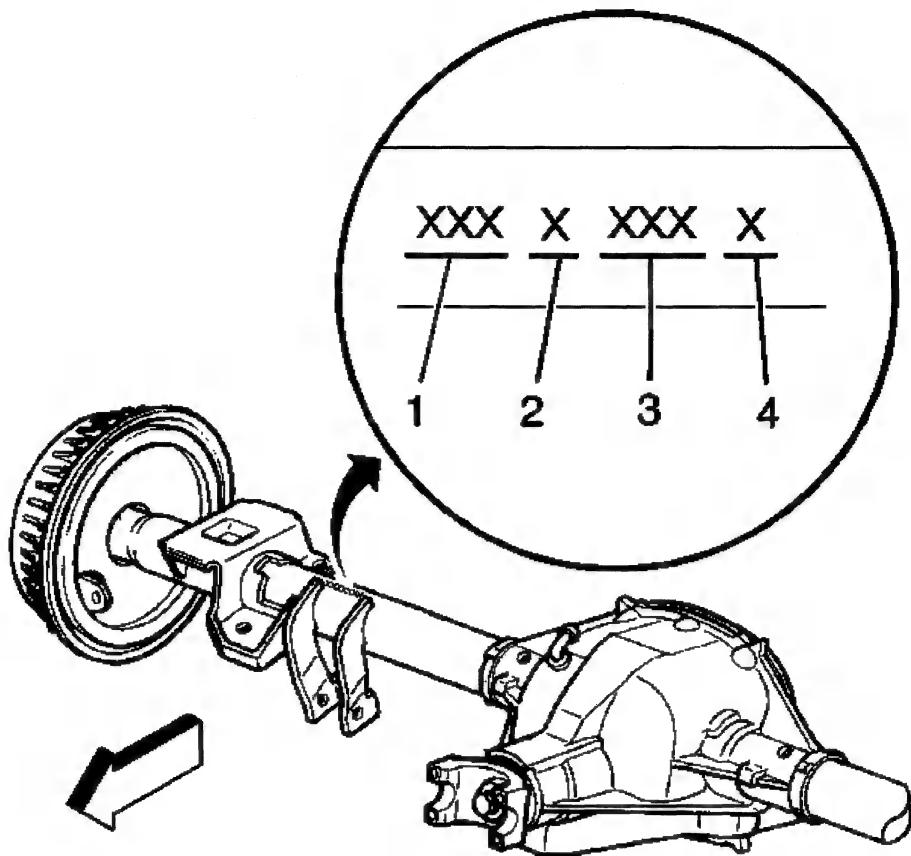


1. Calendar Year
2. Julian Date of the Year
3. Shift and Line Number
4. Plant
5. Model
6. Location on Transmission

### Engine and Transmission Usage

Body Type	Truck Line & Truck Type	Engine Size	Fuel System	Engine RPO	Trans Used	Trans RPO
G1500	Chevrolet / GMC Express / Savana 1/2 TON Full Size Van	4.3L V6	CSFI	L35	4L60E	M30
		5.0L V8	CSFI	L30	4L60E	M30
		5.7L V8	CSFI	L31	4L60E	M30
G2500	Chevrolet / GMC Express / Savana 3/4 TON Full Size Van	4.3L V6	CSFI	L35	4L60E	M30
		5.0L V8	CSFI	L30	4L60E	M30
		5.7L V8	CSFI	L31	4L60E	M30
G3500	Chevrolet / GMC Express / Savana 1 TON Full Size Van	4.3L V6	CSFI	L35	4L60E / 4L80E	M30 / MT1
		5.7L V8	CSFI	L31	4L60E / 4L80E	M30 / MT1
		6.5L V8 DSL Turbo	SFI	L65	4L80E	MT1
		7.4L V8	SFI	L29	4L80E	MT1

### Axle Identification – Rear



- (1) The first three digits indicate the rear axle ratio.
- (2) The next digit indicates the axle assembly build source code (D) Detroit (C) Buffalo and (K) Canada.
- (3) The next three digits indicate the day built, displayed in Julian Date form.
- (4) The last digit indicates the shift (1) First and (2) Second.

All rear axles are identified by a broadcast code on the right axle tube near the carrier. The rear axle identification and manufacturer's codes must be known before attempting to adjust or to repair axle shafts or the rear axle case assembly. Rear axle ratio, differential type, manufacturer, and build date information is stamped on the right axle tube on the forward side.

## **Labeling - Anti-Theft**

### **Notice**

The anti-theft label found on some major body panels MUST be covered before performing any painting, rustproofing or undercoating procedures. The mask must also be removed following those procedures. Failure to follow these precautionary steps may result in liability for violation of the Federal Vehicle Theft Prevention Standard, and subject the vehicle owner to possible suspicion that the part was stolen.

Federal law requires General Motors (GM) to affix a label to certain parts on selected vehicles with the Vehicle Identification Number (VIN). The purpose of this law is to reduce the number of motor vehicle thefts by helping in the tracing and recovery of parts from stolen vehicles. The certification label on the driver's door qualifies as a theft deterrent label.

The theft deterrent label will be permanently affixed to an interior surface of the part and will contain the complete VIN. The label on replacement parts will contain the letter R, the manufacturer's logo, and the acronym for the Department of Transportation (DOT). DO NOT deface, or remove these labels.

## RPO Code List

The production/process codes provide the description of the Regular Production Options (RPOs) used on the vehicle. The RPO list is printed on the Service Parts Identification Label. The following is a list of the RPO abbreviations and the description of each:

RPO	Description
AG1	Seat Adjuster, Power, 6-way, Driver
AG2	Seat Adjuster, Power, 6-way, Passenger
AJ1	Windows, deep Tint, all Except W/S and DRS
AJ3	Restraint System, SIR Driver
AK5	Restraint System, SIR Driver/Passenger
AQ8	Seat, Temporary For Shipping
AR7	Seat, Front Bucket, Standard
AS5	Seat, Front Bucket, Deluxe
AU0	Lock, Control Remote Entry
AU3	Lock, Control Power
AX4	Restraint Conversion, Manual Seat, European
A07	Window, Body
A08	Window, Body, Right Side
A12	Window, Rear Stationary, Back Door
AU3	Lock Control, Side Door, Electric
A08	Window, Body, Right Side
A12	Window, Rear, Stationary, Back Door
A13	Window, Side Door, Stationary, Rear
A17	Window, Left Body Side, Swing Out
A18	Window, Rear Door, Swing Out
A19	Window, Rear Side Door, Swing Out
A26	Window, European Glazing, All
A31	Window, Power Operated, Side
A86	Modification, Restraint System, Export
BAG	Parts Package, Export
B3D	Equipment, School Bus
B30	Covering, Floor Carpet
B31	Covering, Floor Vinyl, Front
B32	Covering, Front Floor Mats Auxiliary
B33	Covering, Rear Floor Mats, Auxiliary
B38	Covering, Floor Vinyl, Full Mat
B84	Bodyside Molding
C3F	GVW Rating, 7,700 Lbs
C36	Heater, Auxiliary
C42	HVAC System, Heater Deluxe
C49	Defogger, Rear Window, Electric
C5M	GVW Rating 6,100 Lbs
C5Y	GVW Rating 7,100 Lbs
C6A	GVW Rating ,7,300 Lbs

2000 Chevrolet Express Van Restoration Kit

C6P	GVW Rating 8,600 Lbs
C60	Air Conditioning
C69	Air Conditioning, Rear
C7A	GVW Rating, 10, 000 Lbs
C7E	GVW Rating, 11,000 Lbs
C7G	GVW Rating, 11,500 Lbs
C7L	GVW Rating, 12,000 Lbs
C7N	GVW Rating, 12,300 Lbs
DE2	Mirror, Outside, LH & RH, Direct Control
DE5	Mirror, Outside, LH & RH, Remote Control, Heated
DF2	Mirror, Outside, Camper Type, Stainless Steel
DH6	Mirror, Inside Sunshade, Illuminated, LH & RH
D28	Mirror, Outside, Delete
D31	Mirror, Inside, Rear View, Tilt
E23	GVW Rating, 9,500 Lbs
E24	Door, Side Cargo, Hinged
FE9	Certification, Emission, Federal
GT4	Rear Axle, 3.73 Ratio
GT5	Rear Axle, 4.10 Ratio
GU6	Rear Axle, 3.42 Ratio
G80	Rear Axle, Positraction
HC4	Rear Axle, 4.56 Ratio
JB6	Brake, Power Disc/Drum 7,200 Lbs
JB8	Brake, Power Disc/Drum 10,000 Lbs
JD7	Brake, Hydraulic Power, Disc/Drum, 8,400 Lbs
KC4	Cooling System, Engine Oil
KD1	Cooling System, Transmission Oil , Internal
KL5	Engine Modification, Natural Gas
KW2	Generator, 124 AMP
KXB	Generator, Dual, 100 AMP
K05	Heater, Engine Block
K19	Reactor System, AIR Injection
K34	Cruise Control, Automatic, Electronic
K50	Fuel Tap Fitting (Motorhome)
K53	Fuel Sender, Robust Fuel System
K55	Fuel Sender, Low Lubricity
K60	Generator, 100 AMP
L29	Engine, Gas, 8 Cylinder, 7.4L MFI
L30	Engine, Gas, 8 Cylinder, 5.0L CPI
L31	Engine, Gas, 8 Cylinder, 5.7L CPI
L35	Engine, Gas, 6 Cylinder, 4.3L CPI
L65	Engine, Diesel, 8 Cylinder, 6.5L Turbo
M30	Transmission, Hydra-Matic 4L60-E, 4-Speed Automatic, Electronic
MT1	Transmission, Hydra-Matic 4L80-E, 4-Speed Automatic, Electronic
NA1	Emission, Under 8,500 Lbs GVW

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NA4	Emission, Over 8,500 Lbs GVW
NA7	Emission System, European
NB6	Emission System, California
NE7	Fuel Tank, 55 Gallon, (208 Liters)
NC1	Emission System, Federal, Tier 1
NC7	Emission Override, Federal System
NF2	Emission System, Federal, Tier 1
NL1	Fuel Tank, 35 Gallon, (132 Liters)
NM8	Leaded Fuel System Compatible
NN6	Emission Override, Diesel Fuel, Export
NN8	Emission Override, Unleaded Fuel, Export
NP5	Steering Wheel, Leather Wrapped
N12	Exhaust System, Rear Exit
N33	Steering Column, Tilt Type
N83	Wheel, 15 x 7.0, Chrome, Styled
N90	Wheel, 15 x 7.0, Aluminum
PNA	Front Door Trim Panels, Uplevel
PNC	All Door Trim Panels, Uplevel
PNF	Interior Trim Panels, Delete
PO6	Trim Rings
Q80	Wheel, Front, 22.5 X 6.75 8 Hole, 275 MM
RO5	Wheel Dual, Rear
TGK	Color Combination, Special Paint, Solid
TR2	Lamp, Turn Signal, Enlarged
TR6	Headlamp Control, Leveling System, Manual
TR9	Lamp Group
T2H	Ornamentation, Exterior, Export Unique Requirements
T62	Lighting, Daytime Running, Delete
T65	Lighting, Daytime Running, Export
T79	Fog Lamp, Rear
T84	Headlamps, Right Hand Rule of Road, E-Mark
T89	Lamp, Tail and Stop, Export
T90	Lamp, Signaling and Marker, Export
UA6	Theft Deterent System
UC2	Speedometer, Instrument, Kilometers & Miles, Kilometer Odometer, Positive Bias
UD4	Alarm, Vehicle Speed, 120 K/H
UJ1	Indicator, System, Brake Warning
UL0	Radio, AM/FM Stereo, Seek/Scan, Auto Reverse Cassette, Music Search
UL5	Radio, Delete
UL2	Radio, European Frequencies
UM6	Radio, AM/FM Stereo, Seek/Scan, Auto Reverse Cassette, Clock, ETR
UM7	Radio, AM/FM Stereo, Seek/Scan, Clock, ETR
UN0	Radio, AM/FM Stereo, Seek/Scan, Compact Disc, Auto Tone
UP0	Radio, AM/FM Stereo, Seek/Scan, Auto Reverse, Music Search, Cassette,

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	Compact Disc Player, Auto Tone
UP8	Radio Provisions For Stereo
UW3	Radio, AM/FM Stereo, Seek/Scan, Auto Reverse, Music Search
UY7	Wiring Harness, Trailer, Heavy Duty
U73	Antenna, Fixed, Radio
U75	Antenna, Power
VD1	Provision Options, Europe
VK3	License Plate Front, Front Mounting Package
VK5	Seat, Temporary, For Shipping
VL4	License Plate Front, Front Mounting Package, EEC
VL5	License Plate, Rear Mounting Package
VR4	Trailer Hitch, Weight Distributing Platform
VR6	Hook, Tie Down
VXS	Vehicle, Complete
VXT	Vehicle, Incomplete
V14	Auxiliary Transmission Oil Cooler
V16	Auxiliary Engine Oil Cooler
V22	Radiator Grille, Chrome
V37	Bumper, Front and Rear, Chrome
V46	Bumper, Front, Chrome
V70	Hook, Tow, Frame Mounted
WX7	Wiring Provisions
XCU	Tire, Front, P215/75R15 B/W
XHA	Tire, Front, P235/75R15 B/W
XHB	Tire, Front, P235/75R15 W/S
XHF	Tire, Front, LT225/75R16/E B/W
XHH	Tire, Front, LT245/75R16/E B/W
XHM	Tire, Front, P235/75R15 RWOL
XHP	Tire, Front, LT225/75R16/D B/W
X88	Nameplate, Chevrolet
YA2	Door, Side Rear, Sliding
YCU	Tire, Rear, P215/75R15 B/W
YC6	Convenience Package: Decor Level #6
YF2	Sales Package, Ambulance Upfitter
YF7	Sales Package, Recreational Vehicle Upfitter
YG6	HVAC System: Air Conditioning, Not Desired
YHA	Tire, Rear, P235/75R15 B/W
YHB	Tire, Rear, P235/75R15 W/S
YHF	Tire, Rear, LT225/75R16/E B/W
YHH	Tire, Rear, LT245/75R16/E B/W
YHM	Tire, Rear, P235/75R15 RWOL
YHP	Tire, Rear, LT225/75R16/D B/W
ZCU	Tire, Spare, P215/75R15 B/W
ZHA	Tire, Spare, P235/75R15 B/W
ZHB	Tire, Spare, P235/75R15 B/W

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ZHF	Tire, Spare, LT225/75R16 B/W
ZHH	Tire, Spare, LT245/75R16 B/W
ZHM	Tire, Spare, P235/75R15 RWOL
ZHP	Tire, Spare, LT225/75R16/D B/W
ZP0	Seating Arrangement, Temporary Driver
ZP3	Seating Arrangement, Fifteen Passenger
ZP5	Seating Arrangement, Five Passenger
ZP8	Seating Arrangement, Eight Passenger
ZW9	Body Equipment, Base Body or Chassis
ZX1	Seating Arrangement, Driver Only, High Back
ZX2	Seating Arrangement, Driver & Passenger, Highback
ZX5	Seating Arrangement, Twelve Passenger
ZY1	Color Combination, Solid
Z88	Nameplate, GMC
01U	Primary Color, Exterior, Special
14U	Primary Color, Exterior, Light Gray Metalic
17U	Primary Color, Exterior, Silvermist Metallic
2HI	Tire, Front, LT225/75R16/E R/ST ST HWY
25U	Primary Color, Exterior, Cadet Blue Metallic
26G	Trim Combination, Cloth, Navy (G)
26I	Interior Trim, Navy (I)
26W	Trim Combination, Vinyl, Navy (W)
27U	Primary Color, Exterior, Medium Sapphire Blue Metalic
28U	Primary Color, Exterior, Blue Mettalic
3HI	Tire, Rear, LT225/75R16/E B/W
31U	Fire Mist Green Metallic
35U	Primary Color, Exterior, Yellow
39U	Indigo Blue Metallic
41U	Primary Color, Exterior, Black
55U	Light Autumnwood Metallic
5E6	Nameplate, ABS
5G2	Wheel Color, White
5G4	Provisions, Lamp, Roof Mounted
5H4	Wiring Provisions, Heavy Gage, Extended
5P2	Wheel, Special, Aluminum
5X8	Cylinder Unit, Side Cargo and Rear Door
5Z1	Engine Oil Pan, 5 Quart
5Z5	Hubcaps Deletion
50U	Primary Color, Exterior, Blue White
52G	Trim Combination, Cloth, Light Neutral (G)
52I	Interior Trim, Light Neutral (I)
52W	Trim Combination, Vinyl, Light Neutral (W)
55U	Primary Color, Exterior, Light Autumn Wood Metallic
58U	Primary Color, Exterior, Canyon Yellow Pearl
6L8	Mirror, Outside, Stainless Steel

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6M1	Mirror: Outside Rearview, White
6M3	Mirror, Outside LH and RH, Wide Angle
60U	Primary Color, Exterior, Gold Metallic
69U	Primary Color, Exterior, Cinnamon Metallic
7Y4	Meter, Engine Hour
7Y9	Battery, 770 CCA, Single
74U	Victory Red
76U	Dark Bronze Mist Metallic
71U	Primary Color, Exterior, Bright Torch Red
79I	Interior Trim, Ruby Red
8E1	Fuel, Additional 3 Gallons
8E3	Bumper, Rear, Painted Black
8E6	Bumper, Rear, Painted
8E8	Bumper, Front, Painted Black
8E9	Bumper, Front, Painted White
8N2	Color Overide, Seat Belt, Orange
8N9	Speaker, Radio Delete
8R2	Valve, Long Stem 3 3/8
8R3	Valve, Metal
8R8	Filter Fuel, Spin Off
8S8	Wiring Provisions, Odometer Security
8T6	Propeller Shaft Zerk Fitting Delete
8U9	Engine Modification, Gas, 6 Cylinder, 4.3L
8X1	Vehicle Label, Fasten Seat Belts
8X9	Vehicle Label, Front End Alignment
9B9	Governor, Electronic Speed Sensor, 70 MPH
9C2	Governor, Electronic Speed Sensor, 65 MPH
9C7	Cap, Coolant Recovery Bottle with Teather
9E9	GVW Rating 8,600 Lbs (SEO)
9F0	HVAC Provisions, Fitting, A/C Quick Disconnect
9F2	Mirror, Outside, Delete
9F8	Mirror, Outside, LH and RH West Coast, Large
9K5	Hub, Painted
9L4	Wiring Provisions, 12 Volt Power Supply
9P1	Compartment, Front Door Stowage, Delete
9S6	Wiring Provisions, Tail Light, Heavy Gage
9T7	Door, Right Hand, Delete
9V5	Color, Woodland Green
9V9	Color, Doeskin Tan
9W2	Color, Polar White
9W3	Color, Wheatland Yellow, Lead Free
9W4	Color, Tangier Orange, Lead Free
92G	Trim Combination, Cloth, Medium Dark Pewter
92I	Interior Trim, Medium Dark Pewter
92W	Trim Combination, Vinyl, Med Dark Pewter

## Technical Information

### Maintenance and Lubrication

#### Capacities - Approximate Fluid

Application	Specification	
	Metric	English
<b>Engine Cooling System</b>		
• 4.3L (VIN W) without Rear Heater	10.4 L	11.0 Qt
• 4.3L (VIN W) with Rear Heater	13.2 L	14.0 Qt
• 5.0L (VIN M) without Rear Heater	16.0 L	17.0 Qt
• 5.0L (VIN M) with Rear Heater	18.9 L	20.0 Qt
• 5.7L (VIN R) without Rear Heater	16.0 L	17.0 Qt
• 5.7L (VIN R) with Rear Heater	18.9 L	20.0 Qt
• 6.5L (VIN F) without Rear Heater	22.2 L	23.5 Qt
• 6.5L (VIN F) with Rear Heater	24.6 L	26.0 Qt
• 7.4L (VIN J) without Rear Heater	21.8 L	23.0 Qt
• 7.4L (VIN J) with Rear Heater	24.6 L	26.0 Qt
<b>Engine Crankcase</b>		
• 4.3L (VIN W) with Filter	4.3 L	4.5 Qt
• 5.0L (VIN M) with Filter	4.8 L	5.0 Qt
• 5.7L (VIN R) with Filter	4.8 L	5.0 Qt
• 6.5L (VIN F) with Filter	6.5 L	8.0 Qt
• 7.4L (VIN J) with Filter	6.5 L	7.0 Qt
<b>Rear Drive Axle</b>		
• 1/2 Ton all vehicles	2.5 L	2.6 Qt
• 3/4 Ton vehicles with 4.3 L, 5.0 L and 5.7 L Engines	2.8 L	2.9 Qt
• 3/4 Ton with 6.5 L Diesel and 1 Ton all vehicles	3.0 L	3.2 Qt
<b>Transmission</b>		
• 4L60-E - After Filter/Pan Removal	4.7 L	5.0 Qt
• 4L60-E - After Complete Overhaul	10.6 L	11.0 Qt
• 4L80-E - After Filter/Pan Removal	7.3 L	7.7 Qt
• 4L80-E - After Complete Overhaul	12.8 L	13.5 Qt
<b>Fuel</b>		
Standard Tank	131.53 L	35.0 Gal
Optional Tank	208.0 L	55.0 Gal

**Maintenance Items**

Usage	Type
<b>Air Cleaner</b>	
• 4.3L (VIN W)	AC Type AC917C
• 5.0L (VIN M)	AC Type AC917C
• 5.7L (VIN R)	AC Type AC917C
• 6.5L (VIN F)	AC Type AC917C or for extremely dirty or dusty environments AC Type A1236C
• 7.4L (VIN J)	AC Type AC917C
<b>Engine Oil Filter</b>	
• 4.3L (VIN W)	AC Type PF-52
• 5.0L (VIN M)	AC Type PF-1218
• 5.7L (VIN R)	AC Type PF-1218
• 6.5L (VIN F)	AC Type PF-1218
• 7.4L (VIN J)	AC Type PF-1218
<b>PCV Valve</b>	
• 4.3L (VIN W)	AC Type CV769C
• 5.0L (VIN M)	AC Type CV769C
• 5.7L (VIN R)	AC Type CV769C
• 7.4L (VIN J)	AC Type CV774C
<b>Spark Plugs and Gaps</b>	
• 4.3L (VIN W)	AC Type 41-932 (GAP 1.52 mm, 0.060 in)
• 5.0L (VIN M)	AC Type 41-932 (GAP 1.52 mm, 0.060 in)
• 5.7L (VIN R)	AC Type 41-932 (GAP 1.52 mm, 0.060 in)
• 7.4L (VIN J)	AC Type 41-932 (GAP 1.52 mm, 0.060 in)
<b>Fuel Filter</b>	
• 4.3L (VIN W)	AC Type GF-481
• 5.0L (VIN M)	AC Type GF-481
• 5.7L (VIN R)	AC Type GF-481
• 6.5L (VIN F)	AC Type TP-1263
• 7.4L (VIN J)	AC Type GF-481
<b>Radiator Cap</b>	
• 4.3L (VIN W)	AC Type RC-36
• 5.0L (VIN M)	AC Type RC-36
• 5.7L (VIN R)	AC Type RC-36
• 6.5L (VIN F)	AC Type RC-33
• 7.4L (VIN J)	AC Type RC-36

## Fluid and Lubricant Recommendations

Usage	Fluid/Lubricant
Engine Oil (Gasoline Engine)	Engine Oil with the American Petroleum Institute Certified for Gasoline Engines Starburst symbol of the proper viscosity. To determine the preferred viscosity for your vehicle's engine, refer to Engine Oil Viscosity in Explanation of Scheduled Services.
Engine Oil (Diesel Engine)	Engine Oil with the letters CG-4 designation may appear either alone, or in combination with other API designations, such as API CG-4/SH, CG-4/SJ, SH/CG-4, or SJ/CG-4. These letters show American Petroleum Institute (API) levels of quality. To determine the preferred viscosity for your vehicle's diesel engine.
Engine Coolant	50/50 mixture of clean, drinkable water and use only GM Goodwrench® DEX-COOL® or Havoline® DEX-COOL® Coolant.
Hydraulic Brake System	Delco Supreme 11® Brake Fluid (GM Part No. 12377967 or equivalent DOT-3 Brake Fluid).
Windshield Washer Solvent	GM Optikleen® Washer Solvent (GM Part No. 1051515) or equivalent.
Hydraulic Clutch System	Hydraulic Clutch Fluid (GM Part No. 12345347 or equivalent DOT-3 Brake Fluid).
Parking Brake Cable Guides	Chassis Lubricant (GM Part No. 12377985 or equivalent meeting requirements of NLGI#2, Category LB or GC-LB).
Power Steering System	GM Power Steering Fluid (GM Part No. 1052884 - 0.4732 liters (1 pint), 1050017 - 0.9464 liters (1 quart), or equivalent).
Manual Transmission (5-Speed with Low Gear, RPO MW3)	GM Goodwrench Synthetic Manual Transmission Fluid (GM Part No. 12346190 - 0.9464 liters (1 quart) or equivalent SAE 75W-90 GL-4 Gear Oil.
Automatic Transmission	DEXRON®-III Automatic Transmission Fluid
Key Lock Cylinders	Multi-Purpose Lubricant, Superlube® (GM part No. 12346241 or equivalent).
Floor Shift Linkage	Lubriplate® Lubricant Aerosol (GM Part No. 12346293 or equivalent) or lubricant meeting requirements of NLGI #2, Category LB or GC-LB.
Chassis Lubrication	Chassis Lubricant (GM Part No. 12377985 or equivalent) or Lubricant meeting requirements of NLGI No. 2, Category LB or GC-LB.
Front Wheel Bearings (RWD)	Wheel Bearing Lubricant meeting requirements of NLGI #2, Category GC or GC-LB (GM Part No. 105344 or equivalent).
Front Axle (Standard Differential)	Lubricant (GM Part No. 1052271, or equivalent).
Rear Axle (Standard Differential)	SAE 75W-90 Synthetic Axle Lubricant, GM Part No. 12378261 (in Canada use Part No. 10953455) or equivalent meeting GM Specification 9986115.
Rear Axle (Locking Differential)	SAE 80W-90 Axle Lubricant; use only GM Part No. 1052271. Do not add friction modifier.
Rear Axle (Locking Differential) (Diesel Engine)	Axle Lubricant; use only GM Part No. 1052271. Do not add friction modifier.
Differential, C3 (HD3500) Trucks With Dana Rear Axle	SAE 75W-140 Synthetic Axle Lubricant (GM Part No. 12346140) or equivalent.
Manual Transfer Case	DEXRON®-III Automatic Transmission Fluid.
Automatic Transfer Case	Automatic Transfer Case Fluid (GM Part No. 12378396).
Front Axle Propshaft Spline, Rear Driveline Center Splines and Universal Joints	Chassis Lubricant (GM Part No. 12377985 or equivalent) or lubricant meeting requirements of NLGI #2, Category LB or GC-LB.
One-Piece Propshaft Spline (Two-Wheel Drive with Auto. Trans)	Spline Lubricant, Special Lubricant (GM Part No. 12345879) or lubricant meeting requirements of GM 9985830.
Hood Latch Assembly, Secondary	Lubriplate® Lubricant Aerosol (GM Part No. 12346293 or equivalent)

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Latch, Pivots, Spring Anchor and Release Pawl.	or lubricant meeting requirements of NLGI #2, Category LB or GC-LB.
Hood and Door Hinges	Multi-Purpose Lubricant, Superlube® (GM Part No. 12346241 or equivalent).
Body Door Hinge Pins, Tailgate Hinge and Linkage Folding Seat and Fuel Door Hinge	Multi-Purpose Lubricant Superlube® (GM Part No. 12346241 or equivalent).
Tailgate Handle Pivot Points, Hinges, Latch Bolt and Linkage	Multi-Purpose Lubricant Superlube® (GM Part No. 12346241 or equivalent).
Weatherstrip Conditioning	Dielectric Silicone Grease (GM Part No. 12346241 or equivalent).
Weatherstrip Squeaks	Synthetic Grease with teflon, Superlube® (GM Part No. 12371287 or equivalent).

## Descriptions and Operations

### Power Steering System Description and Operation

The hydraulic power steering system consists of the following components:

- The pump
- The fluid reservoir
- The steering gear
- The pressure hose
- The return hose

The power steering pump is a vane-type pump. The pump houses the internal components inside the reservoir. The pump operates submerged in oil.

Two bore openings are located at the rear of the pump housing. The larger opening contains the following components:

- The cam ring
- The pressure plate
- The thrust plate
- The rotor and vane assembly
- The end plate

The smaller opening contains the following components:

- The pressure hose union
- The flow control valve
- The spring

The flow control orifice is part of the pressure control union. The pressure relief valve inside the flow control valve limits the pump pressure.

The power steering gear has a recirculating ball system. The system acts as a rolling thread between the worm shaft and the rack position. The lower end of the worm shaft is supported by a preloaded thrust bearing and two conical thrust races. The upper end of the worm shaft is supported by an adjusted plug. When you turn the worm shaft right, the rack piston moves up in the gear. When you turn the worm shaft left, the rack piston moves down in gear. The rack piston teeth mesh with the sector. The sector is part of the pitman shaft. The pitman shaft turns the wheels through the steering linkage.

The control valve in the steering gear directs the power steering fluid to either side of the rack piston. The rack piston converts the hydraulic pressure into a mechanical force. You can control the vehicle manually if the steering system becomes damaged and loses hydraulic pressure.

### Steering Linkage Description and Operation

The steering linkage consists of the following components:

- A pitman arm
- A connecting rod
- 2 idler arms
- A relay rod
- 2 adjustable tie rods

When you turn the steering wheel, the steering gear rotates the pitman arm which forces the relay rod to one side. The tie rods connect to the relay rod with the ball studs. The tie rods transfer the steering force

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to the wheels. Use the tie rods in toe adjustments. The tie rods are adjustable. The pitman arm and the idler arm support the relay rod. The idler arm pivots on a support attached to the frame rail.

The overall condition of the steering linkage affects steering performance. The steering will function improperly and dangerously if the components are the following:

- Bent
- Damaged
- Worn
- Poorly lubricated

In the heavy duty series, when you turn the wheel, the gear rotates the Pitman arm. The Pitman arm forces the adjustable drag link to one side. The tie rod moves sideways, activating the steering knuckles and turning the wheels.

The condition of the steering linkage affects the steering performance. If parts are bent, damaged, worn, or poorly lubricated, potentially dangerous steering action will result.

## **Steering Wheel and Column - Standard Description and Operation**

The steering wheel and column has 4 primary functions:

- Vehicle steering
- Vehicle security
- Driver convenience
- Driver safety

### **Vehicle Steering**

The steering wheel is the first link between the driver and the vehicle. The steering wheel is fastened to a steering shaft within the column. At the lower end of the column, the intermediate shaft connects the column to the steering gear.

### **Vehicle Security**

Theft deterrent components are mounted and designed into the steering column. The following components allow the column to be locked in order to minimize theft:

- The ignition switch
- The steering column lock
- The ignition cylinder

### **Driver Convenience**

The steering wheel and column may also have driver controls attached for convenience and comfort. The following controls may be mounted on or near the steering wheel or column.

- The turn signal switch
- The hazard switch
- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad/cruise control switch
- The redundant radio/entertainment system controls
- The tilt or tilt/telescoping functions
- The HVAC controls

## **Driver Safety**

The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The mounting capsules break away from the mounting bracket in the event of an accident.

## Suspension Description and Operation

### Rear Suspension

All of the C/K series vehicles use a leaf spring and a solid rear axle suspension system. The rear axle assembly is attached to the multi-leaf springs by the U-bolts. The front ends of the springs are attached to the frame at the front hangers through the rubber bushings. The rear ends of the springs are attached to the frame with the shackles that allow the springs to change their length while the vehicle is in motion.

The ride control is provided by two identical direct double-acting shock absorbers angle-mounted between the frame and the brackets attached to the axle tubes.

### Wheels and Tires

#### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Dual Wheel Nuts	240 N·m	175 lb ft
Single Wheel Nuts	190 N·m	140 lb ft
Spare Tire Hoist Retaining Bolt	20 N·m	15 lb ft
Spare Tire Retaining Nut	52 N·m	38 lb ft
Valve Stem Retaining Nut	4 N·m	35 lb in

#### General Description

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

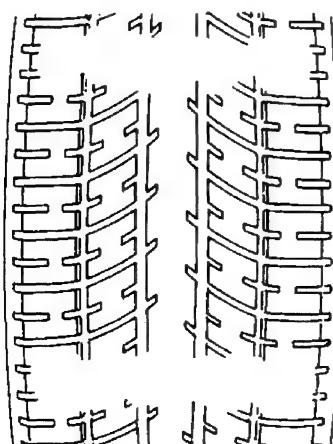
The following factors have an important influence on tire life:

- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

#### Tread Wear Indicators Description



The original equipment tires have tread wear indicators that show when you should replace the tires.

The location of these indicators are at 72 degree intervals around the outer diameter of the tire. The indicators appear as a 6 mm (0.25 in) wide band when the tire tread depth becomes 1.6 mm (2/32 in).

### **Metric Wheel Nuts and Bolts Description**

Metric wheel/nuts and bolts are identified in the following way:

- The wheel/nut has the word Metric stamped on the face.
- The letter M is stamped on the end of the wheel bolt.

The thread sizes of metric wheel/nuts and the bolts are indicated by the following example: M12 x 1.5.

- M = Metric
- 12 = Diameter in millimeters
- 1.5 = Millimeters gap per thread

### **Tire Inflation Description**

When you inflate the tires to the recommended inflation pressures, the factory-installed wheels and tires are designed in order to handle loads to the tire's rated load capacity. Incorrect tire pressures, or under-inflated tires, can cause the following conditions:

- Vehicle handling concerns
- Poor fuel economy
- Shortened tire life
- Tire overloading

Inspect the tire pressure when the following conditions apply:

- The vehicle has been sitting at least 3 hours.
- The vehicle has not been driven for more than 1.6 km (1 mi).
- The tires are cool.

Inspect the tires monthly or before any extended trip. Adjust the tire pressure to the specifications on the tire label. Install the valve caps or the extensions on the valves. The caps or the extensions keep out dust and water.

The kilopascal (kPa) is the metric term for pressure. The tire pressure may be printed in both kilopascal (kPa) and psi. One psi equals 6.9 kPa.

### **Inflation Pressure Conversion (Kilopascals to PSI)**

<b>kPa</b>	<b>psi</b>	<b>kPa</b>	<b>psi</b>
140	20	215	31
145	21	220	32
155	22	230	33
160	23	235	34
165	24	240	35
170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60

**Conversion: 6.9 kPa = 1 psi**

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Tires with a higher than recommended pressure can cause the following conditions:

- A hard ride
- Tire bruising
- Rapid tread wear at the center of the tire

Tires with a lower than recommended pressure can cause the following conditions:

- A tire squeal on turns
- Hard steering
- Rapid wear and uneven wear on the edge of the tread
- Tire rim bruises and tire rim rupture
- Tire cord breakage
- High tire temperatures
- Reduced vehicle handling
- High fuel consumption
- Soft riding

Unequal pressure on the same axle can cause the following conditions:

- Uneven braking
- Steering lead
- Reduced vehicle handling

### Tire Description

#### Caution

**Do not mix different types of tires on the same vehicle such as radial, bias, and bias-belted tires except in emergencies because vehicle handling may be seriously affected and may result in loss of control and possible serious injury.**

This vehicle is equipped with speed rated tires. Listed below are the common speed rating symbols and the corresponding maximum speeds:

Speed Symbol	Maximum Speed (km/h)	Maximum Speed (mp/h)
S	180	112
T	190	118
U	200	124
H	210	130
V	240	149
Z	Over 240	Over 149

A Tire Performance Criteria (TPC) specification number is molded in the sidewall near the tire size of all original equipment tires. Usually, a specific TPC number is assigned to each tire size. The TPC specification number assures that the tire meets the following GM's performance standards.

- Meets the standards for traction.
- Meets the standards for endurance.
- Meets the standards for dimension.
- Meets the standards for noise.
- Meets the standards for handling.
- Meets the standards for rolling resistance, and others.

The following is required of replacement tires:

- Replacement tires must be of the same size as the original tires.

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- Replacement tires must be of the same speed rating as the original tires.
- Replacement tires must be of the same load index as the original tires.
- Replacement tires must be of the same construction as the original tires.
- Replacement tires must have the same TPC specification number as the original tires.

The following may seriously be affected by the use of any other tire size, tire speed rating or tire type:

- May seriously affect the ride.
- May seriously affect the handling.
- May seriously affect the speedometer/odometer calibration.
- May seriously affect the antilock brake system.
- May seriously affect the vehicle ground clearance.
- May seriously affect the trailering capacity.
- May seriously affect the tire clearance to the body.
- May seriously affect the tire clearance to the chassis.

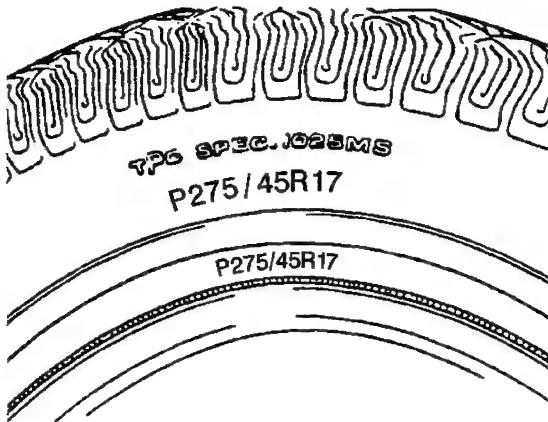
### Conditions for Tire Replacement

Replace the tires when one and/or all of the following conditions are evident:

- When the tire(s) is worn to a point where 1.6 mm (2/32 in) or less of tread remains. The tires have built in tread wear indicators that appear between the tread grooves when the tread is worn to 1.6 mm (2/32 in) or less to help in the detection of this condition. Replace the tire when the indicators appear in two or more adjacent grooves at three spots around the tire.
- When the following conditions are evident on the tread:
  - When the tread is cracked.
  - When the tread is cut.
  - When the tread is snagged deeply enough to expose the cord.
  - When the tread is snagged deeply enough to expose the fabric.
  - When the sidewall is snagged deeply enough to expose the cord.
  - When the sidewall is snagged deeply enough to expose the fabric.
- When the following conditions are evident on the tire:
  - When the tire has a bump.
  - When the tire has a bulge (protrusion).
  - When the tire is split.
  - Please note that slight sidewall indentations are normal in radial tires.
- When the following damage is evident on the tire and the damage cannot be correctly repaired because of the size or the location of the damage:
  - When the tire has a puncture.
  - When the tire is cut, or other damage.

Always install new tires in pairs on the same axle. In the event that only one tire is replaced, then pair with the tire having the most tread.

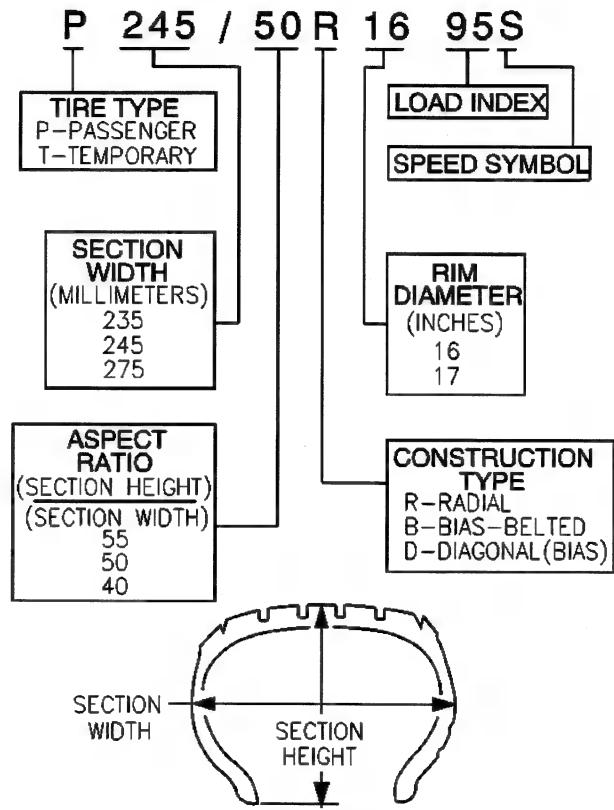
### All Seasons Tires Description



Most GM vehicles are equipped with steel belted all-season radial tires as standard equipment. These tires qualify as snow tires, with a higher than average rating for snow traction than the non-all season radial tires previously used. Other performance areas, such as wet traction, rolling resistance, tread life, and air retention, are also improved. This is done by improvements in both tread design and tread compounds. These tires are identified by an M + S molded in the tire side wall after the tire size. The suffix MS is also molded in the tire side wall after the TPC specification number.

The optional handling tires used on some vehicles now also have the MS marking after the tire size and the TPC specification number.

**P-Metric Sized Tires Description**



Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria (TPC) specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle. Consult a tire dealer if you must replace the P-metric tire with other sizes. Tire companies can best recommend the closest match of alphanumeric to P-metric sizes within their own tire lines.

## **Driveline System Description and Operation**

### **Driveline/Axle – Propeller Shaft**

The Propeller Shaft is a tube with universal joints at both ends which do not require periodic maintenance, that transmit power from the transmission output shaft to the differential.

#### **One Piece Propeller Shaft Description**

A one piece propeller shaft uses a splined slip joint to connect the driveline to the transmission.

#### **Two Piece Propeller Shaft Description**

There are three universal joints used on the two piece propeller shaft. A center bearing assembly is used to support the propeller shaft connection point, and help isolate the vehicle from vibration.

#### **Three Piece Propeller Shaft Description**

There are four universal joints used on the three piece propeller shaft. Two center bearing assemblies are used to support the propeller shaft connection point, and help isolate the vehicle from vibration.

#### **Propeller Shaft Phasing Description**

The driveline components in this vehicle have been system balanced at the factory. System balance provides for a smoother running driveline. These components include the propeller shafts, drive axles, pinion shafts and output shafts. Affixed to the rear axle is a system balanced driveline notice indicating that the driveline components have been factory tested. The propeller shaft is designed and built with the yoke lugs/ears in line with each other. This produces the smoothest running shaft possible. A propeller shaft designed with built in yoke lugs in line is known as in -- phase. An out of phase propeller shaft often causes vibration. The propeller shaft generates vibration from speeding up and slowing down each time the universal joint goes around. The vibration is the same as a person snapping a rope and watching the wave reaction flow to the end. An in phase propeller shaft is similar to 2 persons snapping a rope at the same time and watching the waves meet and cancel each other out. A total cancellation of vibration produces a smooth flow of power in the drive line. All splined shaft slip yokes are keyed in order to ensure proper phasing.

#### **Universal Joint Description**

The universal joint is connected to the propeller shaft. The universal consist of 4 caps with needle bearings and grease seals mounted on the trunnions of a cross or spider. These bearings and caps are greased at the factory and no periodic maintenance is required. There are 2 universal joints used in a one piece propeller shaft and 3 used in two piece propeller shaft. The bearings and caps are pressed into the yokes and held in place with snap rings, except for 2 bearings on some models which are strapped onto the pinion flange of the differential. Universal joints are designed to handle the effects of various loads and rear axle windup conditions during acceleration and braking. The universal joint operates efficiently and safely within the designed angle variations. When the design angles are exceeded, the operational life of the joint decreases.

#### **Center Bearing Description**

Center bearings support the driveline when using 2 or more propeller shafts. The center bearing is a ball bearing mounted in a rubber cushion that attaches to a frame crossmember. The manufacturer prelubricates and seals the bearing. The cushion allows vertical motion at the driveline and helps isolate the vehicle from vibration.

## Rear Drive Axle Description and Operation

Rear axles for this vehicle consist of the following components:

- Differential axle housing
- Differential carrier
- Right and left axle tubes
- Right and left axle shafts

These axles are either full-floating or semi-floating. These axles can be identified as follows: the semi-floating axle has axle shafts with C-clips inside the differential carrier on the inner ends of the axle shafts. The full-floating axle has bolts at the hub retaining the axle shafts to the hub assembly. The axles can be identified by the stamping on the right side axle tube and may also be identified by the ring gear size. The ring gear sizes include 8.60, 9.50, and 10.50 inch axles. The locking differential information for these rear axles can be located in the locking differential section.

The driveline components in this vehicle have been system balanced at the factory. System balance provides for a smoother running driveline. These components include the propeller shafts, drive axles, pinion shafts and output shafts. Affixed to the rear axle is a system balanced driveline notice indicating that the driveline components have been factory tested. All components must be referenced marked before disassembly and reassembly in the exact relationship to each other the components had before removal.

An open differential has a set of four gears. Two are side gears and two are pinion gears. Some differentials have more than two pinion gears. Each side gear is splined to an axle shaft which turns when it's side gear rotates. The pinion gears are mounted on a differential pinion shaft, and the gears are free to rotate on this shaft. The pinion shaft is fitted into a bore in the differential case and is at right angles to the axle shafts. Power is transmitted through the differential as follows: the drive pinion rotates the ring gear. The ring gear, which is bolted to the differential case, rotates the case. The differential pinion, as it rotates the case, forces the pinion gears against the side gears. When both wheels have equal traction, the pinion gears do not rotate on the pinion shaft because the input force on the pinion gear is equally divided between the two side gears. Therefore, the pinion gears revolve with the pinion shaft, but do not rotate around the shaft itself. The side gears, being splined to the axle shafts and in mesh with the pinion gears rotate the axle shafts. If a vehicle were always driven in a straight line, the ring and pinion gears would be sufficient. The axle shaft could be solidly attached to the ring gear and both driving wheels would turn at equal speed. However, if it became necessary to turn a corner, the tires would scuff and slide because the differential allows the axle shafts to rotate at different speeds. When the vehicle turns a corner, the inner wheel turns slower than the outer wheel and slows its rear axle side gear because the shaft is splined to the side gear. The rear axle pinion gears will roll around the slowed rear axle side gear, driving the rear axle side gear wheel faster.

## Locking/Limited Slip Rear Axle Description and Operation

The locking differential consists of the following components:

- Differential case - 1 or 2 piece
- Locking differential spider - 2 piece case only
- Pinion gear shaft - 1 piece case only
- Differential pinion gear shaft lock bolt - 1 piece case only
- 2 clutch discs sets
- Locking differential side gear
- Thrust block
- Locking differential clutch disc guides
- Differential side gear shim
- Locking differential clutch disc thrust washer
- Locking differential governor

- Latching bracket
- Cam plate assembly
- Differential pinion gears
- Differential pinion gear thrust washers

The optional locking differential (RPO G80) enhances the traction capability of the rear axle by combining the characteristics of a limited-slip differential and the ability of the axle shafts to "lock" together when uneven traction surfaces exist. The differential accomplishes this in 2 ways. First by having a series of clutch plates at each side of the differential case to limit the amount of slippage between each wheel. Second, by using a mechanical locking mechanism to stop the rotation of the right differential side gear, or the left differential side gear on the 10.5 inch axle, in order to transfer the rotating torque of the wheel without traction to the wheel with traction. Each of these functions occur under different conditions.

### **Limited-Slip Function**

Under normal conditions, when the differential is not locked, a small amount of limited-slip action occurs. The gear separating force developed in the right-hand (left-hand side on 10.5 inch axle) clutch pack is primarily responsible for this.

The operation of how the limited-slip function of the unit works can be explained when the vehicle makes a right-hand turn. Since the left wheel travels farther than the right wheel, it must rotate faster than the ring gear and differential case assembly. This results in the left axle and left side gear rotating faster than the differential case. The faster rotation of the left-side gear causes the pinion gears to rotate on the pinion shaft. This causes the right-side gear to rotate slower than the differential case.

Although the side gear spreading force produced by the pinion gears compresses the clutch packs, primarily the right side, the friction between the tires and the road surface is sufficient to overcome the friction of the clutch packs. This prevents the side gears from being held to the differential case.

### **Locking Function**

Locking action occurs through the use of some special parts:

- A governor mechanism with 2 flyweights
- A latching bracket
- The left side cam plate and cam side gear

When the wheel-to-wheel speed difference is 100 RPM or more, the flyweights of the governor will fling out and one of them will contact an edge of the latching bracket. This happens because the left cam side gear and cam plate are rotating at a speed different, either slower or faster, than that of the ring gear and differential case assembly. The cam plate has teeth on its outer diameter surface in mesh with teeth on the shaft of the governor.

As the side gear rotates at a speed different than that of the differential case, the shaft of the governor rotates with enough speed to force the flyweights outward against spring tension. One of the flyweights catches its edge on the closest edge of the latching bracket, which is stationary in the differential case. This latching process triggers a chain of events.

When the governor latches, it stops rotating. A small friction clutch inside the governor allows rotation, with resistance, of the governor shaft while one flyweight is held to the differential case through the latching bracket. The purpose of the governor's latching action is to slow the rotation of the cam plate as compared to the cam side gear. This will cause the cam plate to move out of its detent position.

The cam plate normally is held in its detent position by a small wave spring and detent humps resting in matching notches of the cam side gear. At this point, the ramps of the cam plate ride up on the ramps of the cam side gear, and the cam plate compresses the left clutch pack with a self-energizing action.

As the left clutch pack is compressed, it pushes the cam plate and cam side gear slightly toward the right side of the differential case. This movement of the cam side gear pushes the thrust block which compresses the right-hand side gear clutch pack.

At this point, the force of the self-energizing clutches and the side gear separating force combine to hold the side gears to the differential case in the locking stage.

The entire locking process occurs in less than 1 second. The process works with either the left or right wheel spinning, due to the design of the governor and cam mechanism. A torque reversal of any kind will unlatch the governor, causing the cam plate to ride back down to its detent position. Cornering or deceleration during a transmission shift will cause a torque reversal of this type. The differential unit returns to its limited-slip function.

The self-energizing process would not occur if it were not for the action of one of the left clutch discs. This energizing disc provides the holding force of the ramping action to occur. It is the only disc which is splined to the cam plate itself. The other splined discs fit on the cam side gear.

If the rotating speed of the ring gear and differential case assembly is high enough, the latching bracket will pivot due to centrifugal force. This will move the flyweights so that no locking is permitted. During vehicle driving, this happens at approximately 32 km/h (20 mph) and continues at faster speeds.

When comparing the effectiveness of the locking differential, in terms of percent-of-grade capability to open and limited-slip units, the locking differential has nearly 3 times the potential of the limited-slip unit under the same conditions.

### **Locking Differential Torque-Limiting Disc**

The locking differential design was modified in mid-1986 to include a load-limiting feature to reduce the chance of breaking an axle shaft under abusive driving conditions. The number of tangs on the energizing disc in the left-hand clutch pack was reduced allowing these tangs to shear in the event of a high-torque engagement of the differential locking mechanism.

At the time of failure of the load-limiting disc, there will be a loud bang in the rear axle and the differential will operate as a standard differential with some limited-slip action of the clutch packs at low torques.

The service procedure, when the disc tangs shear, involves replacing the left-hand clutch plates and the wave spring. It is also necessary to examine the axle shafts for twisting because at high torques it is possible to not only shear the load-limiting disc, but to also twist the axle shafts.

## **Braking System Description and Operation**

### **Hydraulic Brake System Description and Operation**

#### **System Component Description**

The hydraulic brake system consists of the following:

##### **Hydraulic Brake Master Cylinder Fluid Reservoir**

Contains supply of brake fluid for the hydraulic brake system.

##### **Hydraulic Brake Master Cylinder**

Converts mechanical input force into hydraulic output pressure.

Hydraulic output pressure is distributed from the master cylinder through two hydraulic circuits, supplying diagonally-opposed wheel apply circuits.

##### **Hydraulic Brake Pressure Balance Control System**

Regulates brake fluid pressure delivered to hydraulic brake wheel circuits, in order to control the distribution of braking force.

Pressure balance control is achieved through dynamic rear proportioning (DRP), which is a function of the ABS modulator.

##### **Hydraulic Brake Pipes and Flexible Brake Hoses**

Carries brake fluid to and from hydraulic brake system components.

##### **Hydraulic Brake Wheel Apply Components**

Converts hydraulic input pressure into mechanical output force.

#### **System Operation**

Mechanical force is converted into hydraulic pressure by the master cylinder, regulated to meet braking system demands by the pressure balance control system, and delivered to the hydraulic brake wheel circuits by the pipes and flexible hoses. The wheel apply components then convert the hydraulic pressure back into mechanical force which presses linings against rotating brake system components.

## **Brake Assist System Description and Operation**

#### **System Component Description**

The brake assist system consists of the following:

##### **Brake Pedal**

Receives, multiplies and transfers brake system input force from driver.

##### **Brake Pedal Pushrod**

Transfers multiplied input force received from brake pedal to brake booster.

##### **Vacuum Brake Booster**

Uses source vacuum to decrease effort required by driver when applying brake system input force.

When brake system input force is applied, air at atmospheric pressure is admitted to the rear of both vacuum diaphragms, providing a decrease in brake pedal effort required. When input force is removed, vacuum replaces atmospheric pressure within the booster.

#### **Vacuum Source**

Supplies force used by vacuum brake booster to decrease brake pedal effort.

#### **Vacuum Source Delivery System**

Enables delivery and retention of source vacuum for vacuum brake booster.

#### **System Operation**

Brake system input force is multiplied by the brake pedal and transferred by the pedal pushrod to the hydraulic brake master cylinder. Effort required to apply the brake system is reduced by the vacuum brake booster.

### **Disc Brake System Description and Operation**

#### **System Component Description**

The disc brake system consists of the following components:

#### **Disc Brake Pads**

Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

#### **Disc Brake Rotors**

Uses mechanical output force applied to friction surfaces from the disc brake pads to slow speed of tire and wheel assembly rotation.

#### **Disc Brake Pad Hardware**

Secures disc brake pads firmly in proper relationship to the hydraulic brake calipers. Enables a sliding motion of brake pads when mechanical output force is applied.

#### **Disc Brake Caliper Hardware**

Provides mounting for hydraulic brake caliper and secures the caliper firmly in proper relationship to caliper bracket. Enables a sliding motion of the brake caliper to the brake pads when mechanical output force is applied.

#### **System Operation**

Mechanical output force is applied from the hydraulic brake caliper pistons to the inner brake pads. As the pistons press the inner brake pads outward, the caliper housings draw the outer brake pads inward. This allows the output force to be equally distributed. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of both the brake pad and brake caliper hardware is essential for even distribution of braking force.

## Drum Brake System Description and Operation

### System Component Description

The drum brake system consists of the following:

#### Drum Brake Shoes

Applies mechanical output force (from hydraulic brake wheel cylinders) to friction surface of brake drums.

#### Brake Drums

Uses mechanical output force applied to friction surface from drum brake shoes to slow speed of tire and wheel assembly rotation.

#### Drum Brake Hardware

Secures drum brake shoes firmly in proper relationship to hydraulic brake wheel cylinders. Enables sliding motion of brake shoes needed to expand toward friction surface of drums when mechanical output force is applied; provides return of brake shoes when mechanical output force is relieved.

#### Drum Brake Adjusting Hardware

Provides automatic adjustment of brake shoes to brake drum friction surface whenever brake apply occurs during rearward motion of the vehicle.

### System Operation

Mechanical output force is applied from the hydraulic brake wheel cylinder pistons to the top of the drum brake shoes. The output force is then distributed between the primary and secondary brake shoes as the shoes expand toward the friction surface of the brake drums. The brake shoes apply the output force to the friction surface of the brake drums, which slows the rotation of the tire and wheel assemblies. The proper function of both the drum brake hardware and adjusting hardware is essential to the proper distribution of braking force.

## Park Brake System Description and Operation

The system is a self adjusting component and is located on the left side of the kick panel. This system will not require periodic adjustment. However, there is an adjustment feature built in the system located along the front left of the frame called the equalizer.

The park brake is not designed for use in the place of service brakes. Apply only after the vehicle is brought to a complete stop, except in an emergency. Before working on the park brake system, make sure the service brakes are in good working order and adjusted properly.

### Lever

The park brake lever is located on the left side of the driver's compartment and is activated by foot pressure. The lever assembly has a ratchet mechanism in it to allow varying degrees of park brake application. The park brake handle on the instrument panel allows the driver to release the park brake.

### Cable System

The cable system will vary depending on the type of park brake system used. Models with rear drum brakes use a system that includes one front cable and two rear cables. The front cable connects to the lever on one end and the connector on the other end. The rear cables attach to the equalizer and connector on one end and the park brake struts in the drum brakes on the other end.

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Models with a propeller shaft park brake use a one-cable system. The cable connects to the front lever on one end and the rear lever on the other end.

### **Brake Lamp**

The BRAKE warning lamp on the instrument cluster turns on when the park brake is applied. The lamp can also be turned on by the switch in the combination valve and the antilock brake system.

### **Parking Brake Switch**

The park brake switch is located on the lever assembly. The switch serves as the device to turn on the BRAKE lamp when the parking brake is applied and turn it off when the parking brake is released.

### **Daytime Running Lights**

All vehicles are equipped with a daytime running light (DRL) system. This system uses the park brake switch to turn the headlamps off when the ignition switch is ON and the park brake is applied.

## **ABS Description and Operation**

### **Antilock Brake System**

When wheel slip is detected during a brake application, the ABS enters antilock mode. During antilock braking, hydraulic pressure in the individual wheel circuits is controlled to prevent any wheel from slipping. A separate hydraulic line and specific solenoid valves are provided for each wheel. The ABS can decrease, hold, or increase hydraulic pressure to each wheel brake. The ABS cannot, however, increase hydraulic pressure above the amount which is transmitted by the master cylinder during braking.

During antilock braking, a series of rapid pulsations is felt in the brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the EBCM responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pedal pulsations are present only during antilock braking and stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During antilock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during antilock operation.

Vehicles equipped with ABS may be stopped by applying normal force to the brake pedal. Brake pedal operation during normal braking is no different than that of previous non-ABS systems. Maintaining a constant force on the brake pedal provides the shortest stopping distance while maintaining vehicle stability.

## Engine Description and Operation

### Engine Mechanical – 4.3L

#### General Specifications

Application	Specification	
	Metric	English
<b>General Data</b>		
• Engine Type	V6	
• RPO Code	L35	
• VIN Code	W	
• Displacement	4.3 L	262 CID
• Bore	101.60 mm	4.012 in
• Stroke	88.39 mm	3.480 in
• Compression Ratio	9.2:1	
• Firing Order	1-6-5-4-3-2	
• Spark Plug Gap	1.52 mm	0.060 in
• Oil Pressure - Minimum - at Normal Operating Temperature	42 kPa at 1,000 RPM 125 kPa at 2,000 RPM 166 kPa at 4,000 RPM	6 psig at 1,000 RPM 18 psig at 2,000 RPM 24 psig at 4,000 RPM

#### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Control Cable Bracket Nut	12 N·m	106 lb in
Accelerator Control Cable Bracket Stud to Intake Manifold	6 N·m	53 lb in
Accelerator Control Cable Bracket Stud to Throttle Body	12 N·m	106 lb in
Air Cleaner Adapter Stud	8 N·m	71 lb in
<b>Balance Shaft Driven Gear Bolt</b>		
• First Pass	20 N·m	15 lb ft
• Final Pass	35 degrees	
Balance Shaft Retainer Bolt	12 N·m	106 lb in
Battery Negative Cable Bolt to Engine	25 N·m	18 lb ft
Belt Idler Pulley Bolt	50 N·m	37 lb ft
Camshaft Retainer Bolt	12 N·m	106 lb in
Camshaft Sprocket Bolt	25 N·m	18 lb ft
<b>Connecting Rod Nut</b>		
• First Pass	27 N·m	20 lb ft
• Final Pass	70 degrees	
Crankshaft Balancer Bolt	95 N·m	70 lb ft
<b>Crankshaft Bearing Cap Bolt (Preferred Method)</b>		
• First Pass	20 N·m	15 lb ft
• Final Pass	73 degrees	
Crankshaft Bearing Cap Bolt (Optional Strategy)	105 N·m	77 lb ft
Crankshaft Position Sensor Bolt	9 N·m	80 lb in
Crankshaft Pulley Bolt	58 N·m	43 lb ft
Crankshaft Rear Oil Seal Housing Bolt and Nut	12 N·m	106 lb in
Crankshaft Rear Oil Seal Housing Retainer Stud	6 N·m	53 lb in

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Cylinder Head Bolt (Preferred Method)		
• All Bolts First Pass in Sequence	30 N·m	22 lb ft
• Long Bolts Final Pass in Sequence	75 degrees	
• Medium Bolts Final Pass in Sequence	65 degrees	
• Short Bolts Final Pass in Sequence	55 degrees	
Cylinder Head Bolt (Optional On-Vehicle Strategy)		
• First Pass in Sequence	35 N·m	26 lb ft
• Second Pass in Sequence	60 N·m	44 lb ft
• Final Pass in Sequence	90 N·m	66 lb ft
Cylinder Head Core Hole Plug	20 N·m	15 lb ft
Distributor Cap Bolt	2.4 N·m	21 lb in
Distributor Clamp Bolt	25 N·m	18 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
EGR Valve Bolt		
• First Pass	7 N·m	62 lb in
• Final Pass	30 N·m	22 lb ft
EGR Valve Inlet Pipe Clamp Bolt	25 N·m	18 lb ft
EGR Valve Inlet Pipe Nut at Exhaust Manifold	30 N·m	22 lb ft
EGR Valve Inlet Pipe Nut at Intake Manifold	25 N·m	18 lb ft
Engine Block Coolant Drain Hole Plug	20 N·m	15 lb ft
Engine Block Left Rear Oil Gallery Plug	30 N·m	22 lb ft
Engine Block Left Side Oil Gallery Plug	20 N·m	15 lb ft
Engine Block Oil Gallery Plug	20 N·m	15 lb ft
Engine Block Right Rear Oil Gallery Plug	20 N·m	15 lb ft
Engine Coolant Heater Bolt/Screw	2 N·m	18 lb in
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Engine Flywheel Bolt	100 N·m	74 lb ft
Engine Front Cover Bolt	12 N·m	106 lb in
Engine Lift Bracket Bolt (Special Tool J 41427)	15 N·m	11 lb ft
Engine Lift Front Bracket Stud	35 N·m	26 lb ft
Engine Mount Bolt to Engine Mount Bracket (Frame Side)	58 N·m	43 lb ft
Engine Mount Bracket Bolt to Engine	54 N·m	40 lb ft
Engine Mount Bracket Bolt to Frame	45 N·m	33 lb ft
Engine Mount Bracket Nut to Engine Mount Bracket Bolt (Through-bolt)	68 N·m	50 lb ft
Engine Mount Heat Shield Bolt	6 N·m	53 lb in
Engine Oil Pressure Gauge Sensor	30 N·m	22 lb ft
Engine Oil Pressure Gauge Sensor Fitting (Plus Required Angle)	15 N·m	11 lb ft
Engine Wiring Harness Retainer Nut to Transmission to Engine Stud	10 N·m	89 lb in
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Nut to Intake Manifold	10 N·m	89 lb in
Exhaust Manifold Bolt/Stud		
• First Pass	15 N·m	11 lb ft
• Final Pass	30 N·m	22 lb ft
Fan and Water Pump Pulley Bolt	25 N·m	18 lb ft
Fuel Meter Body Bracket Bolt	10 N·m	89 lb in
Fuel Pipe Bracket Bolt	6 N·m	53 lb in
Fuel Pipe Retainer Nut	3 N·m	27 lb in
Generator and Drive Belt Tensioner Bracket Bolt to Engine	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud Nut	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud to Engine	20 N·m	15 lb ft
Ground Wire Bolt to Rear of Left Cylinder Head	10 N·m	89 lb in

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Ground Wire Nut to Water Outlet Stud	10 N·m	89 lb in
Ground Wire Stud to Rear of Right Cylinder Head	10 N·m	89 lb in
Heater Inlet and Outlet Hose Bracket Bolt to Oil Fill Tube Lower Support	5 N·m	44 lb in
Ignition Coil Stud	12 N·m	106 lb in
Knock Sensor	20 N·m	15 lb ft
Lower Intake Manifold Bolt		
• First Pass in Sequence	3 N·m	27 lb in
• Second Pass in Sequence	12 N·m	106 lb in
• Final Pass in Sequence	15 N·m	11 lb ft
Oil Fill Tube to Oil Fill Tube Lower Support Bolt	5 N·m	44 lb in
Oil Fill Tube Lower Support Bolt and Stud	25 N·m	18 lb ft
Oil Fill Tube Nut	12 N·m	106 lb in
Oil Filter Adapter Bolt	21 N·m	15 lb ft
Oil Filter Fitting	55 N·m	41 lb ft
Oil Level Indicator Tube Bolt	12 N·m	106 lb in
Oil Level Indicator Tube to Oil Fill Tube Lower Support Bolt	5 N·m	44 lb in
Oil Pan Baffle Bolt	12 N·m	106 lb in
Oil Pan Bolt and Nut	25 N·m	18 lb ft
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pump Bolt to Rear Crankshaft Bearing Cap	90 N·m	66 lb ft
Oil Pump Cover Bolt	12 N·m	106 lb in
Power Steering Pump Bolt	50 N·m	37 lb ft
Power Steering Pump Bracket Bolt to Engine	41 N·m	30 lb ft
Power Steering Pump Bracket Stud Nut	41 N·m	30 lb ft
Power Steering Pump Bracket Stud to Engine	20 N·m	15 lb ft
Power Steering Pump Rear Bracket Nut to Engine	41 N·m	30 lb ft
Power Steering Pump Rear Bracket Nut to Power Steering Pump	50 N·m	37 lb ft
Spark Plug		
• Initial Installation (NEW Cylinder Head)	30 N·m	22 lb ft
• All Subsequent Installations	15 N·m	11 lb ft
Spark Plug Wire Support Bolt	12 N·m	106 lb in
Starter Motor Wiring Harness/Transmission Cooler Pipe Bracket Bolt to Oil Pan	9 N·m	80 lb in
Throttle Body Stud	9 N·m	80 lb in
Transmission Bolt to Oil Pan	47 N·m	35 lb ft
Transmission Control Cable Bracket Bolt	40 N·m	30 lb ft
Transmission Cover Bolt	12 N·m	106 lb in
Transmission Fluid Fill Tube Bolt to Rear of Engine	10 N·m	89 lb in
Upper Intake Manifold Stud		
• First Pass	5 N·m	44 lb in
• Final Pass	9 N·m	80 lb in
Vacuum Brake Booster Hose Bracket Nut	11 N·m	97 lb in
Valve Lifter Pushrod Guide Bolt	16 N·m	12 lb ft
Valve Rocker Arm Bolt	30 N·m	22 lb ft
Water Outlet Stud	25 N·m	18 lb ft
Water Pump Bolt	45 N·m	33 lb ft

## **Engine Component Description**

### **Balance Shaft**

The cast iron balance shaft is mounted in the crankcase above and in-line with the camshaft. A camshaft gear drives the gear attached to the balance shaft. The front end of the balance shaft is supported by a ball-type bearing. The rear end of the balance shaft uses a sleeve-type bearing.

### **Camshaft**

The steel camshaft is supported by four bearings pressed into the engine block. The camshaft timing chain sprocket mounted to the front of the camshaft is driven by the crankshaft sprocket through a camshaft timing chain.

### **Crankshaft**

The cast nodular iron crankshaft is supported by four crankshaft bearings. The number four crankshaft bearing at the rear of the engine is the end thrust bearing. The crankshaft bearings are retained by bearing caps that are machined with the engine block for proper alignment and clearances. The crankshaft position sensor reluctor ring has three lugs used for crankshaft timing and is constructed of powdered metal. The crankshaft position sensor reluctor ring has a slight interference fit onto the crankshaft and an internal keyway for correct positioning.

### **Cylinder Heads**

The cast iron cylinder heads have one intake and one exhaust valve for each cylinder. A spark plug is located between the valves in the side of the cylinder head. The valve guides and seats are integral to the cylinder head. The 4.3L heavy duty applications have pressed in exhaust valve seats. The valve rocker arms are positioned on the valve rocker arm supports and retained by a bolt.

### **Engine Block**

The cast iron engine block has six cylinders arranged in a V shape with three cylinders in each bank. Starting at the front side of the engine block, the cylinders in the left bank are numbered 1-3-5 and cylinders in the right bank are numbered 2-4-6 (when viewed from the rear). The firing order of the cylinders is 1-6-5-4-3-2. The cylinders are encircled by coolant jackets.

### **Exhaust Manifolds**

The cast iron exhaust manifolds direct exhaust gases from the combustion chambers to the exhaust system. The left side exhaust manifold has a port for the EGR valve inlet pipe.

### **Intake Manifold**

The intake manifold is a two-piece design. The upper portion is made from a composite material and the lower portion is cast aluminum. The throttle body attaches to the upper manifold. The lower manifold has an exhaust gas recirculation (EGR) port cast into the manifold for mixture. The (EGR) valve bolts into the lower intake manifold. The Central Sequential Multiport Fuel Injection system uses multiple fuel injectors to meter and distribute fuel to each engine cylinder. The Central (SFI) is retained by a bracket bolted to the lower intake manifold. The fuel meter body also houses the pressure regulator. Metal inlet and outlet fuel lines and nylon delivery tubes connect to the Central (SFI) unit. The delivery tubes independently distribute fuel to each cylinder through nozzles located at the port entrance of each manifold runner where the fuel is atomized.

### **Piston and Connecting Rod Assemblies**

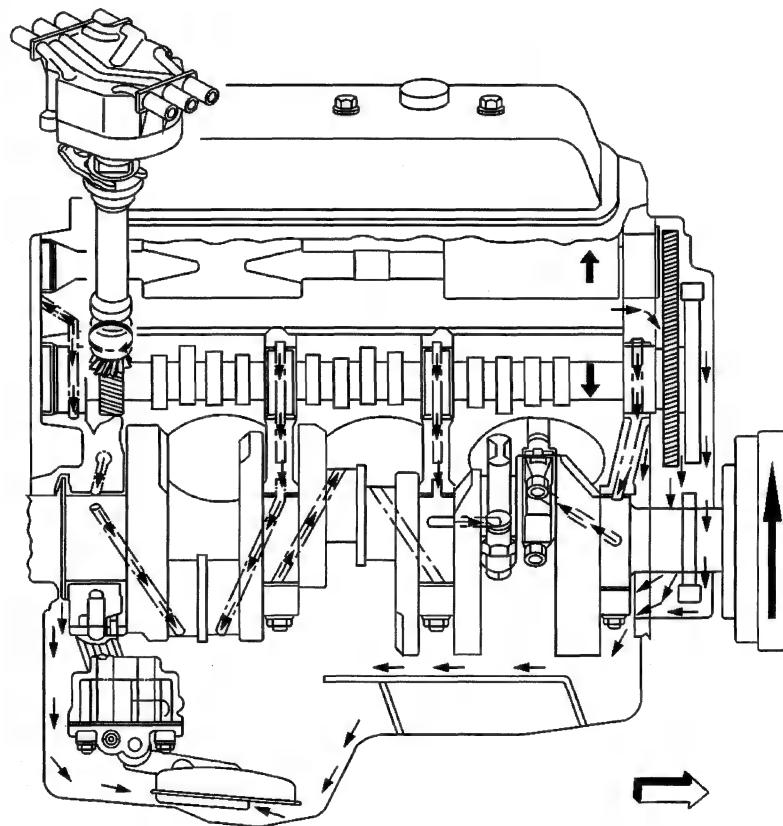
The cast aluminum pistons use two compression rings and one oil control assembly. The piston is a low friction, lightweight design with a flat top and barrel shaped skirt. The piston pins are offset 0.9 mm (0.0354 in) toward the major thrust side (right side) to reduce piston slap as the connecting rod travels

from one side of the piston to the other side after a stroke. The piston pins have a floating fit in the piston and are retained by a press fit in the connecting rod. The connecting rods are forged steel. The connecting rods are machined with the rod cap installed for proper clearances and alignments.

### Valve Train

Motion is transmitted from the camshaft through the hydraulic roller valve lifters and the tubular valve pushrods to the roller type valve rocker arms. The roller type valve rocker arm pivots on a needle type bearing in order to open the valve. The valve rocker arms for each bank of cylinders are mounted to a one piece valve rocker arm support. Each valve rocker arm is retained on the valve rocker arm support and the cylinder head by a bolt. The hydraulic valve lifters keep all the parts of the valve train in constant contact. Each hydraulic valve lifter acts as an automatic adjuster and maintains zero lash in the valve train. This eliminates the need for periodic valve adjustment.

### Lubrication



Full pressure lubrication, through a full-flow oil filter is supplied by a gear-type oil pump. Oil is drawn up through the oil pump screen and passes through the pump to the oil filter. The oil filter is a full-flow paper element unit with an anti-drain back valve. An oil filter bypass valve is used to ensure adequate oil supply, in the event the filter becomes plugged or develops excessive pressure drop. Filtered oil flows into the main gallery and then to the camshaft, the balance shaft, the rear bearing, and the crankshaft bearings. The valve lifter oil gallery supplies oil to the valve lifters. Oil flows from the valve lifters through the hollow valve pushrods to the valve rocker arms. Oil drains back to the crankcase through the oil drain holes in the cylinder head. The camshaft timing chain is drip fed from the front camshaft bearing. The pistons and piston pins are lubricated by oil splash.

**Engine Mechanical – 5.0 & 5.7L****General Specifications 5.0L**

Application	Specification	
	Metric	English
<b>General Data</b>		
• Engine Type	V8	
• Displacement	5.0 L	305 CID
• RPO (VIN Code)	L30 (M)	
• Bore	94.89 mm	3.737 in
• Stroke	88.39 mm	3.480 in
• Compression Ratio	9.4:1	
• Firing Order	1-8-4-3-6-5-7-2	
• Spark Plug Gap	1.52 mm	0.060 in
• Oil Pressure (Minimum at Normal Operating Temperature)	42 kPa at 1,000 RPM 125 kPa at 2,000 RPM 166 kPa at 4,000 RPM	6 psig at 1,000 RPM 18 psig at 2,000 RPM 24 psig at 4,000 RPM

**General Specifications 5.7L**

Application	Specification	
	Metric	English
<b>General Data</b>		
• Engine Type	V8	
• Displacement	5.7 L	350 CID
• RPO (VIN Code)	L31 (R)	
• Bore	101.63 mm	4.0012 in
• Stroke	88.39 mm	3.480 in
• Compression Ratio	9.4:1	
• Firing Order	1-8-4-3-6-5-7-2	
• Spark Plug Gap	1.52 mm	0.060 in
• Oil Pressure (Minimum at Normal Operating Temperature)	42 kPa at 1,000 RPM 125 kPa at 2,000 RPM 166 kPa at 4,000 RPM	6 psig at 1,000 RPM 18 psig at 2,000 RPM 24 psig at 4,000 RPM

**Fastener Tightening Specifications 5.0L & 5.7L**

Application	Specification	
	Metric	English
Accelerator Control Cable Bracket Bolt and Nut	12 N·m	106 lb in
Belt Idler Pulley Bolt	50 N·m	37 lb ft
Camshaft Retainer Bolt	12 N·m	106 lb in
Camshaft Sprocket Bolt	25 N·m	18 lb ft
Connecting Rod Nut		
• First Pass	27 N·m	20 lb ft
• Final Pass	55 degrees	
Crankshaft Balancer Bolt	95 N·m	70 lb ft
Crankshaft Bearing Cap Bolt and Stud (Preferred Method)		
• First Pass (Two Bolt Type Bearing Cap)	20 N·m	15 lb ft

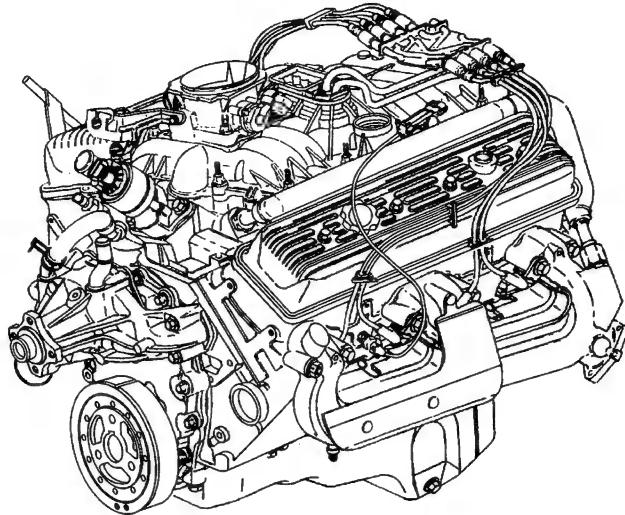
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• Final Pass (Two Bolt Type Bearing Cap)	73 degrees	
• First Pass (Four Bolt Type Bearing Cap)	20 N·m	15 lb ft
• Final Pass Outboard Bolt (Four Bolt Type Bearing Cap)	43 degrees	
• Final Pass Inboard Bolt and Stud (Four Bolt Type Bearing Cap)	73 degrees	
<b>Crankshaft Bearing Cap Bolt and Stud (Optional Strategy)</b>		
• Two Bolt Type Bearing Cap	105 N·m	77 lb ft
• Inboard Bolt and Stud (Four Bolt Type Bearing Cap)	105 N·m	77 lb ft
• Outboard Bolt (Four Bolt Type Bearing Cap)	90 N·m	66 lb ft
<b>Crankshaft Oil Deflector Nut</b>	40 N·m	30 lb ft
<b>Crankshaft Position Sensor Bolt</b>	9 N·m	80 lb in
<b>Crankshaft Pulley Bolt</b>	58 N·m	43 lb ft
<b>Crankshaft Rear Oil Seal Housing Nut and Bolt</b>	12 N·m	106 lb in
<b>Crankshaft Rear Oil Seal Housing Retainer Stud</b>	6 N·m	53 lb in
<b>Cylinder Head Bolt (Preferred Method)</b>		
• All Bolts First Pass in Sequence	30 N·m	22 lb ft
• Long Bolt Final Pass in Sequence	75 degrees	
• Medium Bolt Final Pass in Sequence	65 degrees	
• Short Bolt Final Pass in Sequence	55 degrees	
<b>Cylinder Head Bolt (Optional On-Vehicle Strategy)</b>		
• First Pass in Sequence	35 N·m	26 lb ft
• Second Pass in Sequence	60 N·m	44 lb ft
• Final Pass in Sequence	90 N·m	66 lb ft
<b>Cylinder Head Core Hole Plug</b>	20 N·m	15 lb ft
<b>Distributor Cap Bolt</b>	2.4 N·m	21 lb in
<b>Distributor Clamp Bolt</b>	25 N·m	18 lb ft
<b>Drive Belt Tensioner Bolt</b>	50 N·m	37 lb ft
<b>EGR Valve Bolt</b>		
• First Pass	10 N·m	89 lb in
• Final Pass	30 N·m	22 lb ft
<b>EGR Valve Pipe Nut at Intake Manifold</b>	25 N·m	18 lb ft
<b>EGR Valve Pipe Nut at Exhaust Manifold</b>	30 N·m	22 lb ft
<b>EGR Valve Pipe Clamp Bracket Bolt</b>	25 N·m	18 lb ft
<b>Engine Block Coolant Drain Hole Plug</b>	20 N·m	15 lb ft
<b>Engine Block Oil Gallery Plug</b>	20 N·m	15 lb ft
<b>Engine Coolant Temperature (ECT) Gauge Sensor</b>	20 N·m	15 lb ft
<b>Engine Flywheel Bolt</b>	100 N·m	74 lb ft
<b>Engine Front Cover Bolt</b>	12 N·m	106 lb in
<b>Engine Lift Bracket Bolt (Special Tool J 41427)</b>	15 N·m	11 lb ft
<b>Engine Lift Front Bracket Stud</b>	35 N·m	26 lb ft
<b>Engine Mount Bolt (Through-bolt) to Engine Mount Bracket</b>	95 N·m	70 lb ft
<b>Engine Mount Bolt to Frame</b>	59 N·m	44 lb ft
<b>Engine Mount Bracket Bolt to Engine</b>	51 N·m	38 lb ft
<b>Engine Mount Nut (Through-bolt)</b>	68 N·m	50 lb ft
<b>Engine Mount Nut to Frame</b>	45 N·m	33 lb ft
<b>Engine Oil Pressure Gauge Sensor</b>	30 N·m	22 lb ft
<b>Engine Oil Pressure Gauge Sensor Fitting (Plus Required Angle)</b>	15 N·m	11 lb ft
<b>Engine Wiring Harness Bracket Nut</b>	12 N·m	106 lb in
<b>Evaporative Emission (EVAP) Canister Purge Solenoid Valve Stud</b>	10 N·m	89 lb in
<b>Exhaust Manifold Bolt</b>		
• First Pass	15 N·m	11 lb ft
• Final Pass	30 N·m	22 lb ft

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Fan and Water Pump Pulley Bolt	25 N·m	18 lb ft
Fuel Pipe Bracket Bolt	6 N·m	53 lb in
Fuel Pipe Retainer Nut	3 N·m	27 lb in
Generator and Drive Belt Tensioner Bracket Bolt and Nut to Engine	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud to Engine	20 N·m	15 lb ft
Ignition Coil Stud	12 N·m	106 lb in
Knock Sensor	20 N·m	15 lb ft
Lower Intake Manifold Bolt		
• First Pass in Sequence	3 N·m	27 lb in
• Second Pass in Sequence	12 N·m	106 lb in
• Final Pass in Sequence	15 N·m	11 lb ft
Oil Filter Adapter Bolt	25 N·m	18 lb ft
Oil Filter Fitting	35 N·m	26 lb ft
Oil Level Indicator Tube Bolt	12 N·m	106 lb in
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pan Stud (Front)	6 N·m	53 lb in
Oil Pan Stud Nut	25 N·m	18 lb ft
Oil Pan Bolt or Stud Bolt	12 N·m	106 lb in
Oil Pump Bolt to Rear Crankshaft Bearing Cap		
• First Pass	20 N·m	15 lb ft
• Final Pass		65 degrees
Oil Pump Cover Bolt	12 N·m	106 lb in
Power Steering Pump Bracket Bolt to Engine	41 N·m	30 lb ft
Power Steering Pump Bracket Stud to Engine	20 N·m	15 lb ft
Power Steering Pump Bracket Stud Nut	41 N·m	30 lb ft
Power Steering Pump Bolt	50 N·m	37 lb ft
Power Steering Pump Nut to Engine	41 N·m	30 lb ft
Power Steering Pump Rear Bracket Nut	50 N·m	37 lb ft
Spark Plug		
• Initial Installation (New Cylinder Head)	30 N·m	22 lb ft
• All Subsequent Installations	15 N·m	11 lb ft
Spark Plug Wire Support Bolt	12 N·m	106 lb in
Square Socket Plug (Engine Block Oil Gallery)	20 N·m	15 lb ft
Throttle Body Stud	9 N·m	80 lb in
Transmission Cover Bolt	12 N·m	106 lb in
Upper Intake Manifold Stud		
• First Pass	5 N·m	44 lb in
• Final Pass	10 N·m	89 lb in
Valve Lifter Guide Retainer Bolt	25 N·m	18 lb ft
Valve Rocker Arm Cover Bolt	12 N·m	106 lb in
Water Outlet Stud	25 N·m	18 lb ft
Water Pump Bolt	45 N·m	33 lb ft

## Engine Component Description



The engine block is made of cast iron and has eight cylinders arranged in a V shape with four cylinders in each bank. The cylinder block is a one piece casting with the cylinders encircled by coolant jackets.

### Cylinder Head

The cylinder heads are made of cast iron. The valve guides and valve seats are machined surfaces integral to the cylinder head. The 5.7L heavy duty applications have pressed in exhaust valve seats. The spark plugs are located between the intake and exhaust ports.

### Camshaft

A steel engine camshaft is supported by five camshaft bearings pressed into the engine block. The camshaft sprocket, mounted to the front of the engine camshaft, is driven by the crankshaft sprocket through a camshaft timing chain.

Motion from the engine camshaft is transmitted to the valves by hydraulic roller valve lifters, valve pushrods, and ball-pivot type valve rocker arms.

### Crankshaft

The crankshaft is made of cast nodular iron. The crankshaft is supported by five crankshaft bearings. The crankshaft bearings are retained by the crankshaft bearing caps, which are machined with the engine block for proper alignment and clearances. Light duty 5.0L and 5.7L engines have two bolts per crankshaft bearing cap. The heavy duty 5.7L engines have four bolts per crankshaft bearing cap, on bearing caps 2, 3, and 4. The number 5 crankshaft bearing cap at the rear of the engine is the end thrust bearing cap. The four connecting rod journals (two connecting rods per journal) are spaced 90 degrees apart. The crankshaft position sensor reluctor ring is pushed onto the front of the crankshaft. The crankshaft position sensor reluctor ring has four lugs used for crankshaft timing and it is constructed of powdered metal. The reluctor ring has an interference fit onto the crankshaft and an internal keyway for correct positioning.

## 2000 Chevrolet Express Van Restoration Kit

### **Pistons and Connecting Rods**

The pistons are made of cast aluminum that use two compression rings and one oil control ring assembly. The piston is a low-friction, lightweight design with a flat top and barrel-shaped skirt. The piston pins are chromium steel. The piston pins have a floating fit in the piston and are retained by a press fit in the connecting rod assembly. The connecting rods are made out of either forged powdered metal or forged steel. The connecting rods are machined with the connecting rod cap installed for proper clearances and alignment.

### **Valve Train**

The valve train is a ball pivot type. Motion is transmitted from the camshaft through the hydraulic roller valve lifters and tubular valve pushrods to the valve rocker arms. The valve rocker arm pivots on a ball in order to open the valve. The hydraulic roller valve lifters keep all parts of the valve train in constant contact. The valve rocker arm ball is retained on the valve rocker arm ball stud with a locking nut. The valve rocker arm ball studs are pressed into the cylinder head.

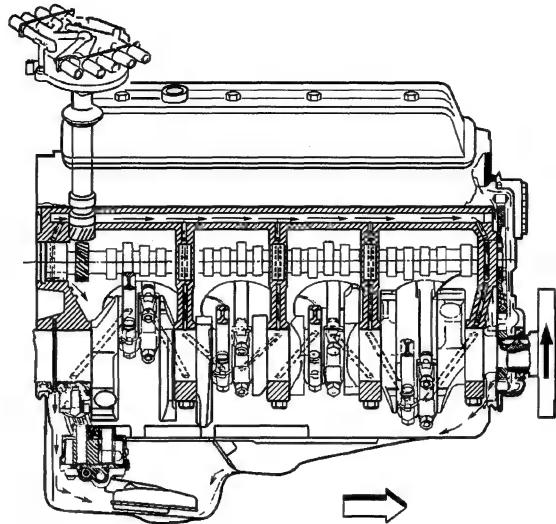
### **Intake Manifold**

The intake manifold is a two piece design. The upper intake manifold portion is made from a composite material and the lower intake manifold portion is cast-aluminum. The throttle body mounts to the upper intake manifold. The lower intake manifold has an exhaust gas recirculation (EGR) port cast into the manifold for mixture of exhaust gases with the fuel and air mixture. The EGR valve mounts to the lower intake manifold.

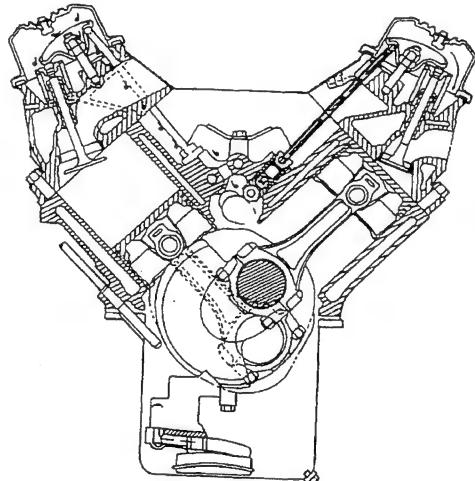
The Central Sequential Multiport Fuel Injection, Central (SFI) system uses multiple injectors to meter and distribute fuel to each engine cylinder. The Central (SFI) unit is retained by a bracket bolted to the lower intake manifold. The TBI fuel meter also houses the pressure regulator. Metal inlet and outlet fuel lines and nylon delivery tubes independently distribute fuel to each cylinder through nozzles located at the port entrance of each manifold runner where the fuel is atomized.

## Lubrication

### Right Side View(c)



### Front View(c)



The gear-type oil pump is driven through an extension driveshaft. The extension driveshaft is driven by the distributor which is gear driven by the camshaft. The oil is drawn from the oil pan through a pickup screen and tube. Pressurized oil is delivered through internal passages in order to lubricate the camshaft and the crankshaft bearings and to provide lash control in the hydraulic valve lifters. Oil is metered from the valve lifters through the valve pushrods in order to lubricate the valve rocker arms and valve rocker arm ball pivots. Oil returning to the oil pan from the cylinder heads and the camshaft front bearing, lubricates the camshaft timing chain and the crankshaft and the camshaft sprockets.

## Drive Belt System Description

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The drive belt idler pulley
- The crankshaft balancer pulley
- The accessory drive component mounting brackets
- The accessory drive components
  - The power steering pump, if belt driven
  - The generator
  - The A/C compressor, if equipped
  - The engine cooling fan, if belt driven
  - The water pump, if belt driven
  - The vacuum pump, if equipped
  - The air compressor, if equipped

The drive belt system may use one belt or two belts. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. There also may be a V-belt style belt used to drive certain accessory drive components. The drive belts are made of different types of rubbers (chloroprene or EPDM) and have different layers or plies containing either fiber cloth or cords for reinforcement.

Both sides of the drive belt may be used to drive the different accessory drive components. When the back side of the drive belt is used to drive a pulley, the pulley is smooth.

The drive belt is pulled by the crankshaft balancer pulley across the accessory drive component pulleys. The spring loaded drive belt tensioner keeps constant tension on the drive belt to prevent the drive belt from slipping. The drive belt tensioner arm will move when loads are applied to the drive belt by the accessory drive components and the crankshaft.

The drive belt system may have an idler pulley, which is used to add wrap to the adjacent pulleys. Some systems use an idler pulley in place of an accessory drive component when the vehicle is not equipped with the accessory.

**Engine Mechanical – 6.5L Turbo Diesel****General Specifications**

Application	Specification	
	Metric	English
<b>General Data</b>		
• Type	V8	
• Displacement	6.5L	396CID
• Bore	103 mm	4.0600 cu in
• Stroke	97 mm	3.8200 cu in
• Compression Ratio	20.2:1	
• Cylinder Compression (Sea Level)	2,550 kPa minimum (subtract 55 kPa per 305 m of elevation above sea level)	370 psi minimum (subtract 8 psi per 1,000 ft of elevation above sea level)
• Firing Order	1-8-7-2-6-5-4-3	
• Cranking RPM (Cold)	100-RPM minimum	
• Cranking RPM (Hot)	180-RPM minimum	
• Oil Pressure (Mechanical Gage) (Hot)	41 kPa minimum @ IDLE 207-296 kPa minimum @ 2000 RPM	6 psi minimum @ IDLE 30-43 psi minimum @ 2000 RPM
• Operating Temperature	88°C	190°F

**Fastener Tightening Specifications**

Application	Specification	
	Metric	English
Accessory/Engine Lift Bracket Nut and Bolts	50 N·m	37 lb ft
Bell Housing Bolts	40 N·m	30 lb ft
Camshaft Gear Bolt	170 N·m	125 lb ft
Camshaft Thrust Plate Bolts	25 N·m	17 lb ft
Connecting Rod Cap Nuts	65 N·m	48 lb ft
Coolant Crossover Bolts/Studs	42 N·m	31 lb ft
Coolant Drain Plugs	25 N·m	18 lb ft
Crankshaft Balancer Bolt	270 N·m	200 lb ft
Crankshaft Bearing Cap Bolts		
• (Inner Bolts-12 mm) First Pass	75 N·m	55 lb ft
• (Inner Bolts-12 mm) Second Pass	75 N·m	55 lb ft
• (Inner Bolts-12 mm) Final Pass	+ 90 Degrees	
• (Outer Bolts-12 mm) First Pass	65 N·m	48 lb ft
• (Outer Bolts-12 mm) Second Pass	65 N·m	48 lb ft
• (Outer Bolts-12 mm) Final Pass	+ 90 Degrees	
• (Outer Bolts-10 mm) Single Pass	40 N·m	30 lb ft
Crankshaft Pulley Bolts	50 N·m	37 lb ft
Crankshaft Sensor Bolt	23 N·m	17 lb ft
Cylinder Head Bolts		
• First Pass	25 N·m	20 lb ft
• Second Pass	75 N·m	55 lb ft
• Third Pass	75 N·m	55 lb ft
• Final Pass	+ 90 Degrees	

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Exhaust Manifolds Bolts	35 N·m	26 lb ft
Flywheel Bolts	90 N·m	65 lb ft
Front Cover Bolts	45 N·m	33 lb ft
Fuel Filter Mount Bolts	42 N·m	31 lb ft
Fuel Filter Water Drain Valve Stud	41 N·m	31 lb ft
Fuel Injection Line Fittings to Fuel Injection Pump	33 N·m	24 lb ft
Fuel Injection Line Fittings to Fuel Injection Nozzles	33 N·m	24 lb ft
Fuel Injection Nozzles	80 N·m	59 lb ft
Fuel Injection Pump Gear Retaining Bolts	25 N·m	20 lb ft
Fuel Injection Pump Nuts	40 N·m	30 lb ft
Glow Plugs	22 N·m	16 lb ft
Intake Manifold Bolts/Studs	42 N·m	31 lb ft
Oil Cooler Line Fittings	75 N·m	55 lb ft
Oil Fill Neck Nuts	23 N·m	17 lb ft
Oil Filter Adapter Bolt	63 N·m	47 lb ft
Oil Gallery Plugs	34 N·m	25 lb ft
Oil Level Indicator Tube Bracket Bolt	4 N·m	35 lb in
Oil Pan (All Except Rear Two Bolts)	10 N·m	89 lb in
Oil Pan (Rear Two Bolts)	23 N·m	17 lb ft
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pump Bolt	90 N·m	65 lb ft
Oil Pump Cover Screws	16 N·m	12 lb ft
Oil Pump Driver Clamp Bolt	42 N·m	31 lb ft
Thermostat Housing Bolts/Studs	47 N·m	35 lb ft
Turbocharger Connector Hose Clamps	6 N·m	50 lb in
Turbocharger Exhaust Manifold Mounting Nuts	58 N·m	43 lb ft
Turbocharger Long Brace Bolt	50 N·m	37 lb ft
Turbocharger Long Brace Nut	34 N·m	26 lb ft
Turbocharger Oil Feed Line Fittings	28 N·m	21 lb ft
Turbocharger Oil Return Pipe Bolts	26 N·m	19 lb ft
Turbocharger Short Brace Bolts	25 N·m	18 lb ft
Upper Intake Connector Hose Clamps	6 N·m	50 lb in
Upper Intake Manifold to Intake Manifold Bolts	23 N·m	17 lb ft
Valve Lifter Guide Plate Clamp Bolts	27 N·m	20 lb ft
Valve Rocker Arm Cover Bolts	27 N·m	20 lb ft
Valve Rocker Arm Shaft Bolts	55 N·m	40 lb ft
Water Pump Plate to Coolant Pump Bolts	28 N·m	20 lb ft
Water Pump Plate to Front Cover Bolts	28 N·m	20 lb ft
Water Pump to Front Cover Bolts	42 N·m	32 lb ft

### Engine Component Description

#### Cylinder Block

The engine block is made of cast iron and it has eight cylinders arranged in a V shape, with four cylinders in each bank. The engine block is a one piece casting with the cylinders encircled by coolant jackets.

#### Cylinder Head

The cylinder heads are made of cast iron. They have parent metal intake and exhaust valve guides, and parent metal intake and exhaust valve seats. The intake and exhaust valve seats are induction hardened for durability. Pre-combustion chambers manufactured from NIMONIC-80 (a high strength, heat resistant alloy) are located with each set of intake/exhaust valves. Glow plugs are located between each set of intake/exhaust valves, in the side of the cylinder head, protruding in to the pre-combustion chamber.

### **Camshaft**

A steel camshaft is supported by five bearings pressed into the engine block. The camshaft sprocket is mounted to the front of the camshaft and is driven by the crankshaft sprocket through a timing chain. Motion from the camshaft is transmitted to the valves by hydraulic roller-type hydraulic valve lifters, valve pushrods, shaft-mounted rocker arms. The valve guides are integral to the cylinder head. A spiral drive gear machined into the camshaft near the rear journal operates the oil pump drive assembly.

### **Crankshaft**

The crankshaft is made of cast nodular iron, with fillet ground main bearing journals. The crankshaft is supported by five precision fit crankshaft bearings, retained by the crankshaft bearing caps. The crankshaft bearing caps are machined with the engine block for proper alignment and clearance. The crankshaft bearing caps are retained by four bolts each. The number three crankshaft bearing at the center of the engine block is the thrust bearing. The four connecting rod journals (two rods per journal) are spaced 90 degrees apart. The crankshaft position sensor reluctor ring has four lugs used for crankshaft timing, and is integral to the crankshaft sprocket.

### **Pistons and Connecting Rods**

The pistons are cast aluminum alloy that use two compression rings and one oil control ring assembly. The piston pins are full floating in the pistons and in the connecting rods, with spring steel retainers at each end of the piston pin bore. The connecting rods are forged steel and have precision insert type crankpin bearings.

### **Valve Train**

The valve train is a shaft-mounted rocker arm type. Motion is transmitted from the camshaft through hydraulic roller-type valve lifters, and tubular valve pushrods, to the valve rocker arms. The valve rocker arm pivots on a shaft in order to open the valve. The hydraulic roller-type valve lifters keep all parts of the valve train in constant contact. Each valve lifter act as an automatic adjuster and maintains zero lash in the valve train. This eliminates the need for periodic valve adjustment. The valve rocker arms are located and retained by nylon retainers press fit to the valve rocker arm shaft, and by the valve rocker arm shaft retaining bolts. The valve rocker arm shaft retaining bolts are installed into the cylinder head.

### **Intake Manifold**

The intake manifold is a two-piece design. Both the upper and lower portions are made of cast aluminum. A Manifold Absolute Pressure (MAP) sensor is mounted at the front of the upper intake manifold and sealed by an O-ring seal.

### **Exhaust Manifold**

The two exhaust manifolds are constructed of cast iron. The exhaust manifolds direct exhaust gases from the combustion chambers to the turbocharger.

### **Turbocharger**

The turbocharger is used to increase the amount of air that enters the engine's cylinders. The increase of air allows a proportional increase of fuel that is injected into the cylinders. The results are:

- Increased power output.
- More complete combustion of the fuel.
- Cooling of the cylinder heads, the pistons, the valves, and the exhaust gas. This cooling effect helps extend engine life.

Engine exhaust gas is directed to the turbine housing. The turbine housing acts as a nozzle to direct the exhaust gas flow to the turbine wheel blades, where heat energy and pressure from the exhaust gas drives the turbine wheel. The turbine wheel is attached to the shaft assembly along with the compressor

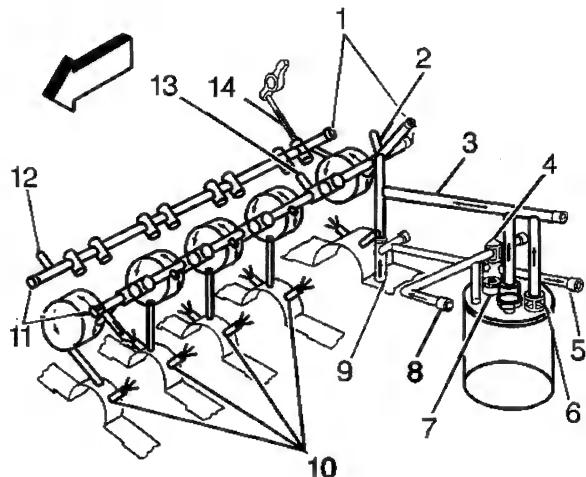
wheel, which rotates at the same speed as the turbine wheel. Clean air from the air cleaner, and crankcase vapors from the Crankcase Depression Regulator (CDR) Valve, are drawn into the compressor housing. The air is compressed by the compressor wheel blades and delivered to the engine upper intake manifold. The inside of the turbocharger compressor housing, the compressor wheel, and the inside of the intake manifold can be very oily (wet) due to the crankcase vapors -- THIS IS NORMAL.

A vacuum-operated wastegate regulator valve in the turbocharger exhaust housing regulates the flow of exhaust gasses, and the amount of boost delivered to the engine by the turbocharger. The wastegate regulator valve is controlled by the PCM, which monitors turbocharger boost pressure, engine RPM, vehicle load and power requirements. Vacuum is applied to the regulator valve to close the wastegate as increased boost is required. Vacuum is removed from the regulator valve to open the wastegate when increased boost is no longer required.

### Vacuum Pump

The belt driven vacuum pump provides vacuum for the operation of the turbocharger wastegate. The vacuum pump does not require periodic maintenance, and is serviced by replacement.

### Lubrication



- (1) Threaded Oil Gallery Plug
- (2) Center Mount Turbocharger Oil Feed
- (3) Clean Oil to Engine
- (4) Oil Cooler Bypass Valve
- (5) To Oil Cooler
- (6) Oil Filter Bypass Valve
- (7) Cup Plug With 0.06 inch Hole
- (8) From Oil Cooler
- (9) From Oil Pump
- (10) Piston Oil Nozzle Galleries
- (11) Main Oil Galleries
- (12) Side Mount Turbocharger Oil Feed
- (13) To Oil Pressure Sensor
- (14) Push Rod Oil Passage To Valve Train

A gear-type oil pump with an enclosed pressure regulator pressurizes the lubrication oil distribution system. The oil pump uses a 552 kPa (80 psi) pressure regulator spring. Bronze bushings in the oil pump

drive/driven gears, and a steel base plate, support the oil pump drive/driven gear shafts. The oil pump is driven by the oil pump drive, which, in turn, is driven by the camshaft. The oil pump draws unpressurized oil through a pickup screen and pipe that are submerged in oil inside the oil pan. The oil flows from the oil pump to an oil cooler, located by the radiator, that cools the oil. The oil cooler is protected from high operating pressure (normally seen only during cold ambient temperature conditions) by the oil cooler bypass valve. The oil cooler bypass valve is located in the engine block oil gallery to oil cooler passage (behind the oil filter or oil filter adapter assembly). The oil flows from the oil cooler or from the oil cooler bypass valve to a full-flow oil filter. The engine is protected from operating without lubrication (due to a clogged filter) by the oil filter bypass valve. The oil filter bypass valve is located in the engine block oil gallery to oil filter passage (behind the oil filter or oil filter adapter assembly).

The oil flows from the oil filter or the oil filter bypass valve to the main oil galleries. An oil pressure sensor is located on the left main oil gallery. The oil flows from the main oil galleries to the camshaft bearing bores. The channel in the camshaft bearing bores supplies the oil to the camshaft bearings and to the main bearing oil galleries. The oil flows from the upper main bearing shells to the crankshaft oil galleries. The crankshaft oil galleries supply oil to the connecting rod bearings. The oil flows from the main oil galleries to the valve lifters. Oil flows from the valve lifters through hollow valve pushrods, to the valve rocker arms. The oil then flows from the main oil galleries to the turbocharger. Oil from the turbocharger drains back to the crankcase through a gallery in the block.

### **Drive Belt Description and Operation**

See Driver Belt Description and Operation in 5.7 & 5.7L section above.

**Engine Mechanical - 7.4L****General Specifications**

Application	Specification	
	Metric	English
<b>General Data</b>		
• Engine Type	V-8	
• Displacement	7.4L	454 CID
• RPO	L29	
• VIN	J	
• Bore	107.95 mm	4.25 in
• Stroke	101.6 mm	4.00 in
• Compression Ratio	9.0:1	
• Firing Order	1-8-4-3-6-5-7-2	
• Spark Plug Gap	0.8890 mm	0.060 in
<b>Lubrication System</b>		
• Oil Capacity without Filter Change	5.7 liters	6.0 qt
• Oil Pressure (Fully Warmed Oil not Hot)	68.65 kPa @ 600 RPM 172.37 kPa @ 2,000 RPM	10 psi @ 600 RPM 25 psi @ 2,000 RPM
• Oil Filter System	Full Flow	
• Oil Pump Type	Gear Driven	

**Fastener Tightening Specifications**

Application	Specification	
	Metric	English
A/C Compressor Bolt	50 N·m	37 lb ft
AIR Pump Mounting Bolt	50 N·m	37 lb ft
Camshaft Retainer Bolt	12 N·m	106 lb in
Camshaft Sprocket Bolt	30 N·m	22 lb ft
Connecting Rod Bolt Nut	64 N·m	47 lb ft
Coolant Outlet Housing Bolt	40 N·m	30 lb ft
Coolant Temperature Gauge Sensor	20 N·m	15 lb ft
Coolant Temperature Sensor	20 N·m	15 lb ft
Crankshaft Balancer Bolt	149 N·m	110 lb ft
Crankshaft Bearing Cap Bolt	138 N·m	102 lb ft
Crankshaft Position Sensor Bolt	12 N·m	106 lb in
Crankshaft Pulley Bolt	40 N·m	30 lb ft
<b>Cylinder Head Bolts First Pass in Sequence</b>		
• All Bolts	50 N·m	37 lb ft
<b>Cylinder Head Bolts Final Pass in Sequence</b>		
• Bolt #1, 2, 3, 6, 7, 8, 9, 12, 14, 15	150 degrees	
• Bolt #13, 16	150 degrees	
• Bolt #4, 5, 10, 11	90 degrees	
Distributor Clamp Bolt	33 N·m	24 lb ft
EGR Inlet Pipe Fitting	60 N·m	44 lb ft
EGR Valve Bolt	22 N·m	16 lb ft
Engine Block Coolant Drain Hole Plug	20 N·m	15 lb ft
<b>Engine Block Oil Gallery Plug</b>		
• Front	30 N·m	22 lb ft
• Left	30 N·m	22 lb ft

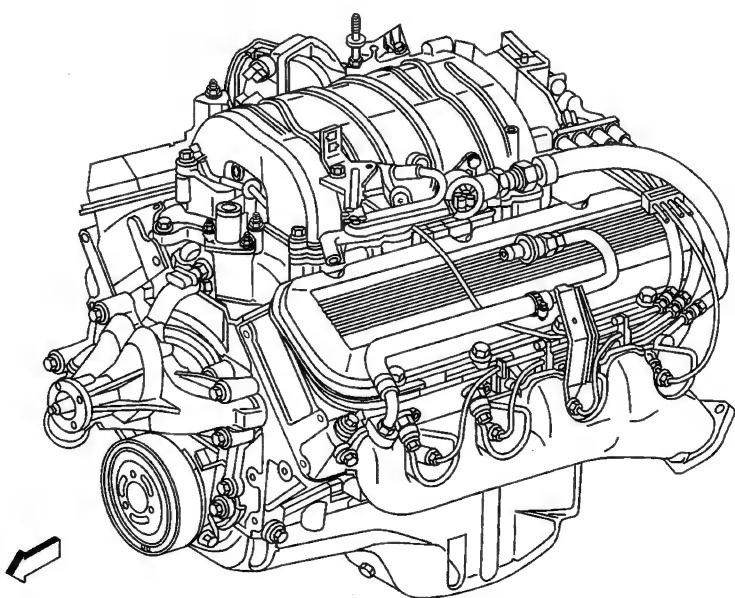
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• Rear	30 N·m	22 lb ft
• Top	20 N·m	15 lb ft
Engine Flywheel Bolt	88 N·m	65 lb ft
Engine Flywheel Housing Bolt	40 N·m	30 lb ft
Engine Front Cover Bolt	10 N·m	30 lb ft
Engine Lift Bracket Bolt (Special Tool J 36857)	40 N·m	106 lb in
Engine Mount		
• Front Mount Bolt	59 N·m	44 lb ft
• Front Mount Nut	45 N·m	33 lb ft
• Rear Mount Bolt	47 N·m	35 lb ft
EVAP Purge Solenoid Bolt	12 N·m	106 lb in
Exhaust Manifold		
• Adapter	160 N·m	118 lb ft
• Center Bolt	54 N·m	40 lb ft
• Nut	30 N·m	22 lb ft
• Stud	30 N·m	22 lb ft
Fuel Rail		
• Bolt	10 N·m	89 lb in
• Stud	25 N·m	18 lb ft
Generator Mounting Bolt	50 N·m	37 lb ft
Generator Mounting Bracket to Engine		
• Long Bolt	66 N·m	49 lb ft
• Short Bolt	66 N·m	49 lb ft
• Nut	66 N·m	49 lb ft
• Stud	20 N·m	15 lb ft
Generator Mounting Rear Bracket Bolt	50 N·m	37 lb ft
Idler Pulley Bolt	50 N·m	37 lb ft
Idler Pulley Bracket		
• Long Bolt	83 N·m	61 lb ft
• Short Bolt	50 N·m	37 lb ft
Ignition Coil		
• Bolt	25 N·m	18 lb ft
• Stud	25 N·m	18 lb ft
Knock Sensor	19 N·m	14 lb ft
Knock Sensor Heat Shield	12 N·m	106 lb in
Lower Intake Manifold Bolt (in Sequence)		
• First Pass	30 N·m	22 lb ft
• Final Pass	40 N·m	30 lb ft
MAP Sensor Nut	25 N·m	18 lb ft
Oil Filter	One Turn After Initial Gasket Contact	
Oil Filter Adapter		
• Bolt	25 N·m	18 lb ft
• Fitting	66 N·m	49 lb ft
Oil Level Indicator Tube Bracket Nut	54 N·m	40 lb ft
Oil Pan Bolt	25 N·m	18 lb ft
Oil Pan Drain Plug	28 N·m	21 lb ft
Oil Pump Bolt	90 N·m	65 lb ft
Oil Pump Cover Bolt	12 N·m	106 lb in
Oil Pressure Gauge Sensor	30 N·m	22 lb ft
Power Steering Pump Mounting Bracket		
• Long Bolt	66 N·m	49 lb ft
• Nut	66 N·m	49 lb ft

## 2000 Chevrolet Express Van Restoration Kit

• Stud	20 N·m	15 lb ft
Power Steering Pump Rear Bracket Bolt	25 N·m	18 lb ft
Spark Plug (New Cylinder Head)	30 N·m	22 lb ft
Spark Plug (all Subsequent Installations)	20 N·m	15 lb ft
Spark Plug Heat Shield Nut	20 N·m	15 lb ft
Starter Motor Bolt	50 N·m	37 lb ft
Starter Motor Shield		
• Bolt	3 N·m	27 lb in
• Nut	5 N·m	44 lb in
Throttle Body		
• Nut	10 N·m	89 lb in
• Stud	12 N·m	106 lb in
Upper Intake Manifold Bolt in Sequence		
• First Pass	8 N·m	71 lb in
• Final Pass	18 N·m	13 lb ft
Valve Lifter Guide Retainer Bolt	25 N·m	18 lb ft
Valve Rocker Arm Bolt	54 N·m	40 lb ft
Valve Rocker Arm Cover Bolt	12 N·m	106 lb in
Water Pump Bolt	40 N·m	30 lb ft
Water Pump Pulley Bolt	25 N·m	18 lb ft

### Engine Component Description



#### Cylinder Block

The engine block is made of cast iron and it has eight cylinders arranged in a V shape with four cylinders in each bank. The cylinder block is a one piece casting with the cylinders encircled by coolant jackets.

### **Cylinder Head**

The cylinder heads are cast iron and have parent metal inlet valve guides and inlet valve seats. Cast iron exhaust valve guides and powdered metal valve seats are pressed into the exhaust ports. A spark plug is located between the valves in the side of the cylinder head.

### **Camshaft**

A steel camshaft is supported by five bearings pressed into the engine block. The camshaft sprocket, mounted to the front of the camshaft, is driven by the crankshaft sprocket through a camshaft timing chain.

Motion from the camshaft is transmitted to the valves by hydraulic roller valve lifters, valve pushrods, and ball-pivot type rocker arms. A spiral gear machined into the camshaft near the rear journal drives a shaft assembly which operates the oil pump driveshaft assembly.

### **Crankshaft**

The crankshaft is made of cast nodular iron. The crankshaft is supported by five crankshaft bearings. The crankshaft bearings are retained by the crankshaft bearing caps, which are machined with the block for proper alignment and clearance. The engine crankshaft bearing caps are retained by four bolts each. The number five crankshaft bearing at the rear of the engine is the end thrust bearing. The four connecting rod journals (two rods per journal) are spaced 90 degrees apart. The crankshaft position sensor reluctor ring is pushed onto the front of the crankshaft. The crankshaft position sensor reluctor ring has four lugs used for crankshaft timing and it is constructed of powdered metal. The reluctor ring has an interference fit onto the crankshaft and an internal keyway for correct positioning.

### **Pistons and Connecting Rods**

The pistons are cast aluminum alloy that use two compression rings and one oil control ring assembly. The piston pins are a floating fit in the pistons and they are retained by a press fit in the connecting rod assembly. Connecting rods are forged steel, with precision insert type crankpin bearings.

### **Valve Train**

The valve train is a ball pivot type. Motion is transmitted from the camshaft through the hydraulic roller valve lifters and tubular valve pushrods to the valve rocker arms. The valve rocker arm pivots on a ball in order to open the valve. The hydraulic roller valve lifters keep all parts of the valve train in constant contact. Each lifter act as an automatic adjuster and maintains zero lash in the valve train. This eliminates the need for periodic valve adjustment. The valve rocker arm bolt retains the valve rocker arm and ball seat. The valve rocker arm bolt is threaded into the cylinder head.

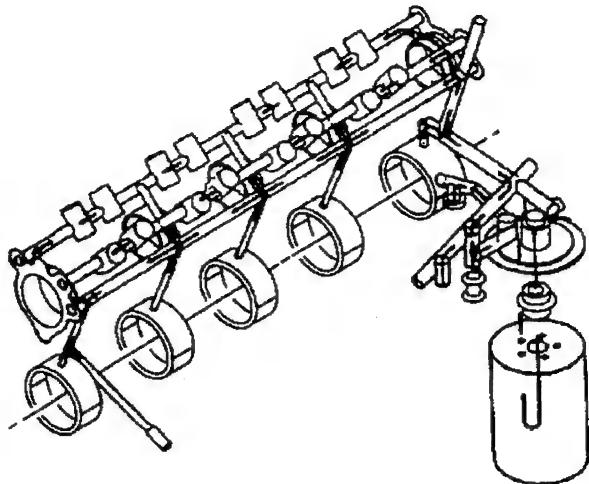
### **Intake Manifold**

The intake manifold is a two-piece design. Both upper and lower portions are made of cast aluminum. The throttle body is attached to the upper manifold. A linear EGR port is cast into the upper intake manifold for exhaust gas recirculation mixture. The (EGR) valve bolts into the upper intake manifold. The fuel rail assembly with eight separate fuel injectors is retained to the intake manifold by six bolts. The injectors are seated in their individual manifold bores with O-ring seals to provide sealing. A Manifold Absolute Pressure (MAP) sensor is mounted at the front of the upper intake manifold and sealed by an O-ring seal. The MAP sensor is retained by a retainer.

### **Exhaust Manifold**

The two exhaust manifolds are constructed of cast iron. The manifolds direct exhaust gases from the combustion chambers to the exhaust system. The manifolds have a threaded port for EGR inlet system pipe fittings. Some manifolds have a threaded port for AIR pipe connections.

## Lubrication



The gear-type oil pump is driven through an extension driveshaft. The extension driveshaft is driven by the distributor which is gear driven by the camshaft. The oil is drawn from the oil pan through a pickup screen and tube. Pressurized oil is delivered through internal passages in order to lubricate camshaft and crankshaft bearings and to provide lash control in the hydraulic valve lifters. Oil is metered from the valve lifters through the valve pushrods in order to lubricate the valve rocker arms and ball pivots. Oil returning to the oil pan from the cylinder heads and the front camshaft bearing, lubricates the camshaft timing chain and the crankshaft and the camshaft sprockets.

## Drive Belt Description and Operation

See Driver Belt Description and Operation in 5.7 & 5.7L section above.

## Engine Cooling

### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Coolant Hose Retaining Bolt	10 N·m	89 lb in
Coolant Pump Pulley Bolts (4.3L, 5.0L and 5.7L)	25 N·m	18 lb ft
Coolant Pump Retaining Bolts	42 N·m	31 lb ft
Coolant Pump Retaining Bolt-to-Plate (6.5L Diesel)	23 N·m	17 lb ft
Coolant Pump Retaining Bolt, behind the Pump Backing Plate (6.5L Diesel)	28 N·m	21 lb ft
Coolant Recovery Reservoir Bolt	11 N·m	97 lb in
Coolant Temperature Sensor	20 N·m	15 lb ft
Engine Coolant Heater Cord Bracket Bolt	12 N·m	106 lb in
Engine Coolant Heater Cord Clip Bolt	12 N·m	106 lb in
Engine Coolant Heater to the Engine Block Bolt	2 N·m	18 lb in
Fan and Clutch Retaining Nut to Water Pump Pulley (4.3L, 5.0L, 5.7L and 6.5L Diesel)	57 N·m	42 lb ft
Fan and Clutch Retaining Nuts to Water Pump Pulley (7.4L)	24 N·m	18 lb ft
Fan to Clutch Retaining Bolts (4.3L, 5.0L, 5.7L and 7.4L)	33 N·m	24 lb ft
Fan to Clutch Retaining Bolts (6.5L Diesel)	17 N·m	13 lb ft
Oil Cooler Line Retaining Clip to Bracket Bolt (6.5L Diesel)	12 N·m	106 lb in
Oil Cooler Line Clip to Bracket Nut (4.3L, 5.0L, 5.7L and 7.4L)	12 N·m	106 lb in
Oil Cooler Line Fittings to the Oil Filter Base	17 N·m	13 lb ft
Oil Cooler Line Fittings to the Oil Filter Base (4.3L Auxiliary Oil Cooler)	35 N·m	26 lb ft
Oil Cooler Line Fittings to the Radiator	24 N·m	18 lb ft
Radiator Air Baffle to Radiator Support	12 N·m	106 lb in
Radiator Surge Tank Bolt	6 N·m	53 lb in
Thermostat Housing Crossover Retaining Bolts	47 N·m	35 lb ft
Thermostat Housing Retaining Bolts (4.3L, 5.0L and 5.7L)	25 N·m	18 lb ft
Thermostat Housing Retaining Bolts (7.4)	40 N·m	30 lb ft
Thermostat Housing Retaining Bolts (6.5L Diesel)	42 N·m	31 lb ft
Upper and Lower Fan Shroud Bolts	8 N·m	71 lb in

### Cooling System Description and Operation

#### Coolant Heater

The optional engine coolant heater (RPO K05) operates using 110-volt AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather -29°C (-20°F). The coolant heater helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. A weather shield on the cord is provided to protect the plug when not in use.

#### Cooling System

The cooling system's function is to maintain an efficient engine operating temperature during all engine speeds and operating conditions. The cooling system is designed to remove approximately one-third of the heat produced by the burning of the air-fuel mixture. When the engine is cold, the coolant does not flow to the radiator until the thermostat opens. This allows the engine to warm quickly.

## **Cooling Cycle**

Coolant flows from the radiator outlet and into the water pump inlet. Some coolant flows from the water pump, to the heater core, then back to the water pump. This provides the passenger compartment with heat and defrost capability as the coolant warms up.

Coolant also flows from the water pump outlet and into the engine block. In the engine block, the coolant circulates through the water jackets surrounding the cylinders where it absorbs heat.

The coolant then flows through the cylinder head gasket openings and into the cylinder heads. In the cylinder heads, the coolant flows through the water jackets surrounding the combustion chambers and valve seats, where it absorbs additional heat.

From the cylinder heads, the coolant flows to the thermostat. The flow of coolant will either be stopped at the thermostat until the engine reaches normal operating temperature, or it will flow through the thermostat and into the radiator where it is cooled. At this point, the coolant flow cycle is completed.

Efficient operation of the cooling system requires proper functioning of all cooling system components. The cooling system consists of the following components:

### **Coolant**

The engine coolant is a solution made up of a 50-50 mixture of DEX-COOL and suitable drinking water. The coolant solution carries excess heat away from the engine to the radiator, where the heat is dissipated to the atmosphere.

### **Radiator**

The radiator is a heat exchanger. It consists of a core and two tanks. The aluminum core is a tube and fin crossflow design that extends from the inlet tank to the outlet tank. Fins are placed around the outside of the tubes to improve heat transfer to the atmosphere.

The inlet and outlet tanks are a molded, high temperature, nylon reinforced plastic material. A high temperature rubber gasket seals the tank flange edge to the aluminum core. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core.

The radiator also has a drain cock located in the bottom of the left hand tank. The drain cock unit includes the drain cock and drain cock seal.

The radiator removes heat from the coolant passing through it. The fins on the core transfer heat from the coolant passing through the tubes. As air passes between the fins, it absorbs heat and cools the coolant.

### **Pressure Cap**

The pressure cap seals the cooling system. It contains a blow off or pressure valve and a vacuum or atmospheric valve. The pressure valve is held against its seat by a spring, which protects the radiator from excessive cooling system pressure. The vacuum valve is held against its seat by a spring, which permits opening of the valve to relieve vacuum created in the cooling system as it cools off. The vacuum, if not relieved, might cause the radiator and/or coolant hoses to collapse.

The pressure cap allows cooling system pressure to build up as the temperature increases. As the pressure builds, the boiling point of the coolant increases. Engine coolant can be safely run at a temperature much higher than the boiling point of the coolant at atmospheric pressure. The hotter the coolant is, the faster the heat transfers from the radiator to the cooler, passing air.

The pressure in the cooling system can get too high. When the cooling system pressure exceeds the rating of the pressure cap, it raises the pressure valve, venting the excess pressure.

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As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the surge tank. This equalizes the pressure in the cooling system with atmospheric pressure, preventing the radiator and coolant hoses from collapsing.

### **Coolant Recovery System**

The coolant recovery system consists of a plastic coolant recovery reservoir and overflow tube. The recovery reservoir is also called a recovery tank or expansion tank. It is partially filled with coolant and is connected to the radiator fill neck with the overflow tube. Coolant can flow back and forth between the radiator and the reservoir.

In effect, a cooling system with a coolant recovery reservoir is a closed system. When the pressure in the cooling system gets too high, it will open the pressure valve in the pressure cap. This allows the coolant, which has expanded due to being heated, is allowed to flow through the overflow tube and into the recovery reservoir. As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum opens the vacuum valve in the pressure cap, allowing some of the coolant in the reservoir to be siphoned back into the radiator. Under normal operating conditions, no coolant is lost. Although the coolant level in the recovery reservoir goes up and down, the radiator and cooling system are kept full. An advantage to using a coolant recovery reservoir is that it eliminates almost all air bubbles from the cooling system. Coolant without bubbles absorbs heat much better than coolant with bubbles.

### **Air Baffles and Seals**

The cooling system uses deflectors, air baffles and air seals to increase cooling system capability. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle and through the radiator to increase engine cooling. Air baffles are also used to direct airflow through the radiator and increase cooling capability. Air seals prevent air from bypassing the radiator and A/C condenser, and prevent recirculation of hot air for better hot weather cooling and A/C condenser performance.

### **Water Pump**

The water pump is a centrifugal vane impeller type pump. The pump consists of a housing with coolant inlet and outlet passages and an impeller. The impeller is mounted on the pump shaft and consists of a series of flat or curved blades or vanes on a flat plate. When the impeller rotates, the coolant between the vanes is thrown outward by centrifugal force.

The impeller shaft is supported by one or more sealed bearings. The sealed bearings never need to be lubricated. Grease cannot leak out, dirt and water cannot get in as long as the seal is not damaged or worn.

The purpose of the water pump is to circulate coolant throughout the cooling system. The water pump is driven by the crankshaft via the drive belt.

### **Thermostat**

The thermostat is a coolant flow control component. Its purpose is to help regulate the operating temperature of the engine. It utilizes a temperature sensitive wax-pellet element. The element connects to a valve through a small piston. When the element is heated, it expands and exerts pressure against the small piston. This pressure forces the valve to open. As the element is cooled, it contracts. This contraction allows a spring to push the valve closed.

When the coolant temperature is below the rated thermostat opening temperature, the thermostat valve remains closed. This prevents circulation of the coolant to the radiator and allows the engine to warm up. After the coolant temperature reaches the rated thermostat opening temperature, the thermostat valve will open. The coolant is then allowed to circulate through the thermostat to the radiator where the engine heat is dissipated to the atmosphere. The thermostat also provides a restriction in the cooling system,

## 2000 Chevrolet Express Van Restoration Kit

after it has opened. This restriction creates a pressure difference which prevents cavitation at the water pump and forces coolant to circulate through the engine block.

### Engine Oil Cooler

The engine oil cooler is a heat exchanger. It is located inside the left side end tank of the radiator. The engine oil temperature is controlled by the temperature of the engine coolant that surrounds the oil cooler in the radiator.

The engine oil pump, pumps the oil through the engine oil cooler line to the oil cooler. The oil then flows through the cooler where the engine coolant absorbs heat from the oil. The oil is then pumped through the oil cooler return line, to the oil filter, to the engine block oil system.

### Transmission Oil Cooler

The transmission oil cooler is a heat exchanger. It is located inside the right side end tank of the radiator. The transmission fluid temperature is regulated by the temperature of the engine coolant in the radiator.

The transmission oil pump, pumps the fluid through the transmission oil cooler line to the transmission oil cooler. The fluid then flows through the cooler where the engine coolant absorbs heat from the fluid. The fluid is then pumped through the transmission oil cooler return line, to the transmission.

## Engine Electrical

### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Auxiliary Battery Hold Down Retaining Bolt	25 N·m	18 lb ft
Auxiliary Battery Tray Retaining Bolts	25 N·m	18 lb ft
Auxiliary Positive and Negative Battery Cable Retaining Bolts to the Battery	15 N·m	11 lb ft
Auxiliary Generator Brace Mounting (Long) Bolts	50 N·m	37 lb ft
Auxiliary Generator Brace Mounting (Short) Bolts	25 N·m	18 lb ft
Auxiliary Generator Bracket Mounting Bolts (A/C Compressor)	50 N·m	37 lb ft
Auxiliary Generator Bracket Mounting Bolt (Backside of the Generator)	25 N·m	18 lb ft
Battery Limiter to Fender Panel Bolt	25 N·m	18 lb ft
Battery Negative Cable Lead to Engine Block Bolt	25 N·m	18 lb ft
Battery Negative Cable Lead to Inner Fender Well Bolt	10 N·m	89 lb in
Battery Negative/ Positive Terminal Bolts	17 N·m	13 lb ft
Camshaft Position Sensor Screws	2 N·m	18 lb in
Distributor Cap Retaining Screws	2.4 N·m	21 lb in
Distributor Clamp Bolt	25 N·m	18 lb ft
Distributor Rotor Retaining Screws	2 N·m	18 lb in
Front Battery Hold Down Retaining Bolt	25 N·m	18 lb ft
Front Battery Tray Retaining Bolts	25 N·m	18 lb ft
Generator Brace to the Generator Bracket Retaining Bolts	50 N·m	37 lb ft
Generator Bracket Mounting Bolts and Nuts (4.3L, 5.0L and 5.7L)	41 N·m	30 lb ft
Generator Bracket Mounting Bolts and Nuts (7.4L)	66 N·m	49 lb ft
Generator Bracket Mounting Bolts and Nuts (6.5L Diesel)	50 N·m	37 lb ft
Generator Front Mounting Bolts	50 N·m	37 lb ft
Generator Output (Bat) Terminal Nut	18 N·m	13 lb ft
Generator Pulley Retaining Nut	100 N·m	74 lb ft
Generator Rear Mounting Bolts	25 N·m	18 lb ft
Ignition Coil Hold Down Studs	11 N·m	97 lb in
Ignition Wire Harness to the Starter Motor Solenoid (Diesel Engines)	6 N·m	53 lb in
Ignition Wire Harness to the Starter Motor Solenoid (Gas Engines)	2 N·m	18 lb in

Oil Fill Tube Screws	5 N·m	44 lb in
Oil Fill Tube Support Bracket Bolt	25 N·m	18 lb ft
Positive Battery Cable Lead to Junction Block Retaining Nut	8 N·m	71 lb in
Positive Battery Cable to the Starter Motor Solenoid (Diesel Engines)	16 N·m	12 lb ft
Positive Battery Cable to the Starter Motor Solenoid (Gas Engines)	10 N·m	89 lb in
Spark Plugs (New Cylinder Head)	30 N·m	22 lb ft
Spark Plugs 4.3L, 5.0L and 5.7L (Used Cylinder Head)	15 N·m	11 lb ft
Spark Plugs 7.4L (Used Cylinder Head)	20 N·m	15 lb ft
Starter Motor Bracket Bolt to the Engine (Diesel Engines)	17 N·m	13 lb ft
Starter Motor Retaining Bolts to the Engine	45 N·m	33 lb ft
Starter Motor Heat Shield Retaining Bolts	3 N·m	27 lb in
Starter Motor Heat Shield Retaining Nuts	6 N·m	53 lb in
Starter Motor Retaining Nut to the Engine Bracket (Diesel Engines)	10 N·m	89 lb in
Starter Motor Field Lead Retaining Nut	11 N·m	97 lb in
Starter Motor Solenoid Clamp Retaining Screws	11 N·m	97 lb in
Starter Motor Solenoid Retaining Bolts	9 N·m	80 lb in
Starter Motor Brush Plate Retaining Screws 28 MT	3 N·m	27 lb in
Starter Motor Drive Housing Retaining Bolts 28 MT	9 N·m	80 lb in
Starter Motor Grounded Brush Retaining Screws 28 MT	2 N·m	18 lb in
Starter Motor Insulated Brush Retaining Screws 28MT	2 N·m	18 lb in
Starter Motor Shift Lever Retaining Nut 28 MT	5 N·m	44 lb in

### Battery Usage

Option	Catalog No	Cold Cranking Amps (CCA)	Reserve Capacity (Minutes)	Load Test (A)	Recommended Replacement
STD	1810	600	115	300	78-6YR
YF2	1812	690	115	350	78-7YR

### Battery Temperature vs Minimum Voltage

Estimated Temperature °F	Estimated Temperature °C	Minimum Voltage
70 or above	21 or above	9.6
50	10	9.4
32	0	9.1
15	-10	8.8
0	-18	8.5
Below 0	Below -18	8.0

### Starter Motor Usage Load Test @ 10 Volts 28-MT

Engine Type	Starter Type	Load Test @ 10 Volts AMPS Minimum	Load Test @ 10 Volts AMPS Maximum	Load Test @ 10 Volts RPM Minimum	Load Test @ 10 Volts RPM Maximum
Diesel Engine	28-MT	125 AMPS	190 AMPS	3,000 RPM	5,600 RPM

### Starter Motor Usage Load Test @ 10 Volts Specs. PG-260

Engine Type	Starter Type	Load Test @ 10 Volts AMPS Minimum	Load Test @ 10 Volts AMPS Maximum	Load Test @ 10 Volts RPM Minimum	Load Test @ 10 Volts RPM Maximum
Gasoline Engine	PG260	47 AMPS	70 AMPS	6,500 RPM	11,000 RPM

## Generator Usage

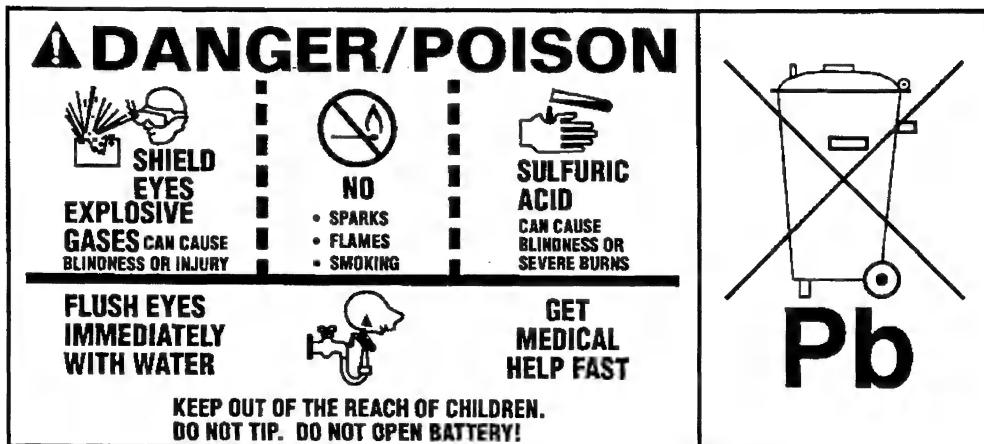
Generator Model	Option Code	Rated Output AMPS	Load Test Output AMPS
CS130D	K60	100 A	70 A
CS130D	K68	105 A	73 A

## Battery Description and Operation

### Caution

Batteries produce explosive gases, contain corrosive acid, and supply levels of electrical current high enough to cause burns. Therefore, to reduce the risk of personal injury when working near a battery:

- Always shield your eyes and avoid leaning over the battery whenever possible.
- Do not expose the battery to open flames or sparks.
- Do not allow the battery electrolyte to contact the eyes or the skin. Flush immediately and thoroughly any contacted areas with water and get medical help.
- Follow each step of the jump starting procedure in order.
- Treat both the booster and the discharged batteries carefully when using the jumper cables.



The maintenance free battery is standard. There are no vent plugs in the cover. The battery is completely sealed except for two small vent holes in the side. These vent holes allow the small amount of gas that is produced in the battery to escape.

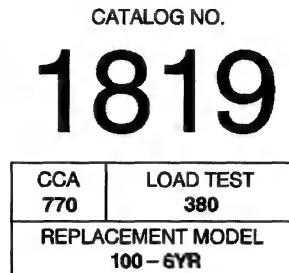
The battery has three functions as a major source of energy:

- Engine cranking
- Voltage stabilizer
- Alternate source of energy with generator overload.

## 2000 Chevrolet Express Van Restoration Kit

The battery specification label (example below) contains information about the following:

- The test ratings
- The original equipment catalog number
- The recommended replacement model number



A battery has 2 ratings:

- Reserve capacity
- Cold cranking amperage

When a battery is replaced use a battery with similar ratings. Refer to the battery specification label on the original battery or refer to Battery Usage .

### **Reserve Capacity**

Reserve capacity is the amount of time in minutes it takes a fully charged battery, being discharged at a constant rate of 25 amperes and a constant temperature of 27°C (80°F) to reach a terminal voltage of 10.5 V. Refer to Battery Usage for the reserve capacity rating of the original equipment battery.

### **Cold Cranking Amperage**

The cold cranking amperage is an indication of the ability of the battery to crank the engine at cold temperatures. The cold cranking amperage rating is the minimum amperage the battery must maintain for 30 seconds at -18°C (0°F) while maintaining at least 7.2 volts. Refer to Battery Usage for the cold cranking amperage rating for this vehicle.

### **Circuit Description**

The battery positive terminal supplies Battery Positive voltage to the under hood fuse block and the rear fuse block. The under hood fuse block provides a cable connection for the generator and a cable connection for the starter.

The battery negative terminal is connected to chassis ground G305 and supplies ground for the AD converter in the DIM.

### **Starting System Description and Operation**

#### **Cranking Circuit**

The cranking circuit consists of the battery, the starter motor, the ignition switch, and related electrical wiring. There is a fusible link in the wire running from the starter solenoid to the generator. For more information on the cranking circuit, refer to Cranking System Operation.

## **Starter Motor**

The PG-260 starter motor achieves gear reduction at the rate of 5:1 through planetary gears. Its relatively small size and light weight offer improved cranking performance and reduced current requirements.

Solenoid windings are energized when the ignition switch is turned to the START position and the transmission is in the NEUTRAL or PARK. The plunger and shift lever movement causes the pinion to mesh with the engine flywheel ring gear, the solenoid main contacts to close, and the engine cranks. When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the key is released, at which time the plunger return spring causes the pinion to disengage. To prevent excessive overrunning, the key should be released immediately when the engine starts.

## **Charging System Description and Operation**

### **Generator**

The generator features the following major components:

- The delta stator
- The rectifier bridge
- The rotor with slip rings and brushes
- A conventional pulley
- Dual internal fans
- The regulator

The pulley and the fan cool the slip ring and the frame.

The generator features permanently lubricated bearings. Service should only include tightening of mount components. Otherwise, replace the generator as a complete unit.

### **Regulator**

The voltage regulator controls the rotor field current in order to limit the system voltage. When the field current is on, the regulator switches the current on and off at a rate of 400 cycles per second in order to perform the following functions:

- Radio noise control
- Obtain the correct average current needed for proper system voltage control

At high speeds, the on-time may be 10 percent with the off-time at 90 percent. At low speeds, the on-time may be 90 percent and the off-time 10 percent.

### **Circuit Description**

The generator provides voltage to operate the vehicle's electrical system and to charge its battery. A magnetic field is created when current flows through the rotor. This field rotates as the rotor is driven by the engine, creating an AC voltage in the stator windings. The AC voltage is converted to DC by the rectifier bridge and is supplied to the electrical system at the battery terminal.

When the engine is running, the generator turn-on signal is sent to the generator from the PCM, turning on the regulator. The generator's voltage regulator controls current to the rotor, thereby controlling the output voltage. The rotor current is proportional to the electrical pulse width supplied by the regulator. When the engine is started, the regulator senses generator rotation by detecting AC voltage at the stator through an internal wire. Once the engine is running, the regulator varies the field current by controlling the pulse width. This regulates the generator output voltage for proper battery charging and electrical system operation. The generator F terminal is connected internally to the voltage regulator and externally to the PCM. When the voltage regulator detects a charging system problem, it grounds this circuit to signal the PCM that a problem exists. The PCM monitors the generator field duty cycle signal circuit. The

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system voltage sense circuit receives battery positive voltage that is Hot At All Times through a fuse link that is connected to the starter motor. This voltage is used by the regulator as the reference for system voltage control.

## Engine Controls

### Engine Controls – 4.3L

#### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Inlet Duct Retaining Nut	2 N·m	18 lb in
Coolant Hose Nipple	17 N·m	13 lb ft
EGR Tube Retaining Bolt	25 N·m	18 lb ft
EGR Valve Attaching Bolts	25 N·m	18 lb ft
Fuel Pipe Nuts	30 N·m	22 lb ft
Fuel Pipe Retaining Nuts	3 N·m	27 lb in
Fuel Rail Attaching Bolts: Center Bolts	10 N·m	8 lb ft
Fuel Rail Attaching Bolts: Front Stud	25 N·m	18 lb ft
Fuel Rail Attaching Bolts: Rear Bolts	10 N·m	8 lb ft
Idle Air Control Attaching Screws	3 N·m	26 lb in
Intake Plenum Bolts	25 N·m	18 lb ft
Power Brake Fitting	13 N·m	115 lb in
Pressure Regulator Screw	9 N·m	84 lb in
Rear Fuel Line Bracket Retaining Bolts	6 N·m	53 lb in
Throttle Body Attaching Nuts	25 N·m	18 lb ft
Throttle Cable Bracket Bolts	25 N·m	18 lb ft
Throttle Position Screws	2 N·m	18 lb in
Upper Manifold Bolts	10 N·m	90 lb in
Upper Manifold Nuts	10 N·m	90 lb in
Vacuum Module Attaching Bolts	10 N·m	88 lb in

#### Fuel System Specifications

See Fuel System Specifications in 5.0L & 5.7L section below.

### Engine Controls – 5.0 & 5.7L

#### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Inlet Duct Retaining Nut	2 N·m	18 lb in
Coolant Hose Nipple	17 N·m	13 lb ft
EGR Tube Retaining Bolt	25 N·m	18 lb ft
EGR Valve Attaching Bolts	25 N·m	18 lb ft
Fuel Pipe Nuts	30 N·m	22 lb ft
Fuel Pipe Retaining Nuts	3 N·m	27 lb in
Fuel Rail Attaching Bolts: Center Bolts	10 N·m	8 lb ft
Fuel Rail Attaching Bolts: Front Stud	25 N·m	18 lb ft
Fuel Rail Attaching Bolts: Rear Bolts	10 N·m	8 lb ft
Idle Air Control Attaching Screws	3 N·m	26 lb in
Intake Plenum Bolts	25 N·m	18 lb ft
Power Brake Fitting	13 N·m	115 lb in
Pressure Regulator Screw	9 N·m	84 lb in
Rear Fuel Line Bracket Retaining Bolts	6 N·m	53 lb in
Throttle Body Attaching Nuts	25 N·m	18 lb ft
Throttle Cable Bracket Bolts	25 N·m	18 lb ft

Throttle Position Screws	2 N·m	18 lb in
Upper Manifold Bolts	10 N·m	90 lb in
Upper Manifold Nuts	10 N·m	90 lb in
Vacuum Module Attaching Bolts	10 N·m	88 lb in

### Fuel System Specifications

Use regular unleaded gasoline rated at 87 octane or higher. It is recommended that the gasoline meet specifications which have been developed by the American Automobile Manufacturers Association (AAMA) and endorsed by the Canadian Motor Vehicle Manufacturers Association for better vehicle performance and engine protection. Gasoline meeting the AAMA specification could provide improved driveability and emission control system performance compared to other gasoline. For more information, write to: American Automobile Manufacturer's Association, 7430 Second Ave, Suite 300, Detroit MI 48202.

Be sure the posted octane is at least 87. If the octane is less than 87, you may get a heavy knocking noise when you drive. If it is bad enough, it can damage your engine.

If you're using fuel rated at 87 octane or higher and you hear heavy knocking, your engine needs service. Don't worry if you hear a little pinging noise when you're accelerating or driving up a hill. That is normal and you don't have to buy a higher octane fuel to get rid of pinging. It is the heavy, constant knock that means you have a problem.

### Notice

Your vehicle was not designed for fuel that contains methanol. Do not use methanol fuel which can corrode metal parts in your fuel system and also damage plastic and rubber parts. This kind of damage would not be covered under your warranty.

If your vehicle is certified to meet California Emission Standards, indicated on the under hood emission control label, your vehicle is designed to operate on fuels that meet California specifications. If such fuels are not available in states adopting California emissions standards, your vehicle will operate satisfactorily on fuels meeting federal specifications, but emission control system performance may be affected. The malfunction indicator lamp on your instrument panel may turn ON and/or your vehicle may fail a smog-check test. If this occurs, return to your authorized dealer for diagnosis to determine the cause of failure. In the event there is a determination that the cause of the condition is the type of fuels used, repairs may not be covered by your warranty.

Some gasolines that are not reformulated for low emissions may contain an octane-enhancing additive called methylcyclopentadienyl manganese tricarbonyl (MMT). Ask your service station operator whether or not the fuel contains MMT.

### Engine Controls – 6.5L Turbo Diesel

#### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Filter Screws	2.8 N·m	25 lb in
Boost (BARO) Sensor Mounting Bolts	3.5 N·m	27 lb in
Crankshaft Position Sensor Mounting Bolt	25 N·m	18 lb ft
Driven Gear to Injection Pump Bolts	25 N·m	18 lb ft
EGR Control Pressure/BARO Sensor	3.5 N·m	27 lb in
Engine Control Temperature Sensor	25 N·m	18 lb ft
Frame Mounted Bracket Nuts	33 N·m	25 lb ft
Fuel Feed Pipe and Suction Pipe to Fuel Pump	30 N·m	22 lb ft
Fuel Manager/Filter to Intake Manifold Bolts	25 N·m	18 lb ft
Fuel Tank Filter Neck Clamp	2.5 N·m	25 lb in

Fuel Tank Off-Road Shield Bolts	35 N·m	26 lb ft
Injection Lines to Nozzle Fittings	25 N·m	18 lb ft
Injection Pump Flange Nuts	40 N·m	30 lb ft
Injection Nozzle	70 N·m	50 lb ft
Intake Air Temperature Sensor	25 N·m	18 lb ft
Upper Intake Manifold Cover Bolts	11 N·m	100 lb in
Water in Fuel Sensor Mounting Screws	2 N·m	13 lb in

### Fuel System Specifications

Some states and provinces have restrictions on the purchase of diesel fuel for light duty vehicles and require you to buy permits or pay special taxes. Some of these restrictions apply to residents, and others apply to both residents and visitors. These restrictions can change. To learn the current restrictions in any state or province, contact your auto club, the police or other officials.

### What Fuel to Use in the United States

In the United States, for best results use Number 2-D diesel fuel year-round (above and below freezing conditions) as oil companies blend Number 2-D fuel to address climate differences. Number 1-D diesel fuel may be used in very cold temperatures (when it stays below 0°F or -18°C); however, the fuel will produce a power and fuel economy loss. The use of Number 1-D diesel fuel in warm or hot climates may result in stalling, poor starting when the engine is hot and may damage the fuel injection system.

Diesel fuel may foam when filling the tank. This can cause the automatic pump nozzle to shut off, even though the tank isn't full. If this happens, just wait for the foaming to stop and then continue to fill the tank.

### What Fuel to Use in Canada

Canadian fuels are blended for seasonal changes. Diesel Type A fuel is blended for better cold weather starting (when it stays below 0°F or -18°C); however, the fuel will produce a power and fuel economy loss. The use of Type A diesel fuel in warmer climates may result in stalling, poor starting. Diesel Type B fuel is blended for temperatures above 0°F (-18°C). The emission control system requires the use of diesel fuel with low sulfur (0.05% by weight) content. Both low and higher sulfur fuels will be available in Canada. Only low sulfur diesel fuels are available in the United States. It is important that diesel-powered trucks are refueled only with low sulfur fuel. Use of fuels with higher-sulfur content will affect the function of the emission components and may cause reduced performance, excessive smoke and unpleasant odor.

### Very Cold Weather Operation

If the vehicle is driven in very cold temperatures and can't get a winterized Number 2-D that has been adapted to cold weather or a Number 1-D, use one gallon of kerosene for every two gallons of diesel fuel. Once you add kerosene, run the engine for several minutes to mix the fuels. Only add kerosene when the temperature falls below 0°F (-18°C), because the fuel economy and lubricating qualities of kerosene isn't as good as that of diesel fuel.

In cold weather, the fuel filter may become clogged (waxed). To unclog the filter, move the vehicle to a warm garage area and warm the filter to a temperature between 32°-50°F (0°-10°C). Replacing the filter is not necessary.

### Water in Fuel

Sometimes, water can be pumped into the fuel tank along with diesel fuel. This can happen if the service station doesn't regularly inspect and clean their fuel tanks, or the fuel gets contaminated for the service stations suppliers.

If water is pumped into the fuel tank, a water in fuel light will illuminate. If the water in fuel light illuminates, the excess water must be drained from the fuel system on the vehicle.

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The water in fuel light also should illuminate briefly when the engine is started as a check. If the light doesn't illuminate, the problem should be fixed to identify a water in fuel condition correctly.

### Engine Controls – 7.4L

#### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Inlet Duct Retaining Nut	2 N·m	18 lb in
Coolant Hose Nipple	17 N·m	13 lb ft
EGR Tube Retaining Bolt	25 N·m	18 lb ft
EGR Valve Attaching Bolts	25 N·m	18 lb ft
Fuel Pipe Nuts	30 N·m	22 lb ft
Fuel Pipe Retaining Nuts	3 N·m	27 lb in
Fuel Rail Attaching Bolts: Center Bolts	10 N·m	8 lb ft
Fuel Rail Attaching Bolts: Front Stud	25 N·m	18 lb ft
Fuel Rail Attaching Bolts: Rear Bolts	10 N·m	8 lb ft
Idle Air Control Attaching Screws	3 N·m	26 lb in
Intake Plenum Bolts	25 N·m	18 lb ft
Power Brake Fitting	13 N·m	115 lb in
Pressure Regulator Screw	9 N·m	84 lb in
Rear Fuel Line Bracket Retaining Bolts	6 N·m	53 lb in
Throttle Body Attaching Nuts	25 N·m	18 lb ft
Throttle Cable Bracket Bolts	25 N·m	18 lb ft
Throttle Position Screws	2 N·m	18 lb in
Upper Manifold Bolts	10 N·m	90 lb in
Upper Manifold Nuts	10 N·m	90 lb in
Vacuum Module Attaching Bolts	10 N·m	88 lb in

#### Fuel System Specifications

See Fuel System Specifications in 5.0L & 5.7L section above

## Exhaust System

### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Exhaust Hanger Bolts	17 N·m	13 lb ft
Exhaust Hanger Nuts	27 N·m	20 lb ft
Exhaust Manifold Studs (All Except Diesel)	17 N·m	13 lb ft
Exhaust Manifold Studs (Diesel)	29 N·m	21 lb ft
Exhaust Pipe Clamps (All Except Tailpipe)	70 N·m	52 lb ft
Exhaust Pipe Clamps (Tailpipe)	47 N·m	35 lb ft
Exhaust Pipe Flange-To-Manifold Nuts (Diesel)	20 N·m	15 lb ft
Exhaust Pipe Flange-To- Exhaust Manifold Nuts (Except Diesel)	65 N·m	48 lb ft
Flat Flange Connection Nut	48 N·m	35 lb ft
Heat Shield Bolts	12 N·m	106 lb in

### Exhaust System Description

#### Important

Use of non-OEM parts may cause driveability concerns.

The exhaust system design varies according to the model designation and the intended use of the vehicle.

In order to secure the exhaust pipe to the exhaust manifold, the exhaust system utilizes a flange and seal joint coupling. A flange and gasket coupling secures the catalytic converter assembly to the muffler assembly.

Hangers suspend the exhaust system from the underbody, allowing some movement of the exhaust system and disallowing the transfer of noise and vibration into the vehicle.

Heat shields protect the vehicle from the high temperatures generated by the exhaust system.

### Exhaust Pipe Description

The exhaust system's design will vary, according to the model designation and the intended use of the vehicle. In order to secure the exhaust pipe to the exhaust manifold, the exhaust system utilizes flange and seal-joint coupling. Subsequent connections in the exhaust system utilize a slip-joint coupling design, with a clamp and a U-bolt.

### Catalytic Converter

The catalytic converter is an emission control device added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) pollutants from the exhaust gas.

The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within a sheet metal shell. The substrate may be washcoated with 3 noble metals:

- Platinum (Pt)
- Palladium (Pd)
- Rhodium (Rh)

The catalyst in the converter is not serviceable.

### **Muffler**

The muffler controls the exhaust noise levels. On some models, the muffler services with the exhaust pipe, not alone as a complete unit.

### **Hangers Description**

Hangers, attached to the frame, suspend the exhaust system. This allows some exhaust system movement, but not the transfer of noise and vibration into the vehicle.

### **Clamps Description**

Flat flanges and single-nut compression are two types of clamps used for connecting the exhaust system joints. Prior to assembly, be sure to coat the slip-joints with the exhaust system sealer GM P/N 9985020 in order to prevent leakage.

## Transmission/Transaxle Description and Operation

### Automatic Transmission – 4L60E

#### Transmission General Specifications

Name	Hydra-matic 4L60-E
RPO Codes	M30
Production Location	Toledo, Ohio Romulus, MI Ramos Arizpe, Mexico
Vehicle Platform (Engine/Transmission) Usage	C/K, C/K 800, F, G, M/L, S/T, Y
Transmission Drive	Longitudinally-Mounted Rear Wheel Drive
1st Gear Ratio	3.059:1
2nd Gear Ratio	1.625:1
3rd Gear Ratio	1.000:1
4th Gear Ratio	0.696:1
Reverse	2.294:1
Torque Converter Size (Diameter of Torque Converter Turbine)	245 mm 258 mm 298 mm 300 mm
Pressure Taps	Line Pressure
Transmission Fluid Type	DEXRON® III
Transmission Fluid Capacity (Approximate)	245 mm Converter Dry: 8.3 l (8.8 qt) 258 mm Converter Dry: 8.8 l (9.3 qt) 298 mm Converter Dry: 11.25 l (11.9 qt) 300 mm Converter Dry: 11.50 l (12.1 qt)
Transmission Type: 4	Four Forward Gears
Transmission Type: L	Longitudinal Mount
Transmission Type: 60	Product Series
Transmission Type: E	Electronic Controls
Position Quadrant	P, R, N, Overdrive, D, 2, 1 P, R, N, Overdrive, 3, 2, 1
Case Material	Die Cast Aluminum
Transmission Weight Dry (Approximate)	245 mm Converter 65.4 kg (144.30 lb) 258 mm Converter 79.9 kg (176.6 lb) 298 mm Converter 70.5 kg (155.70 lb) 300 mm Converter 86.17 kg (190.5 lb)
Transmission Weight Wet (Approximate)	245 mm Converter 72.4 kg (159.55 lb) 258 mm Converter 89.2 kg (197.7 lb) 298 mm Converter 80.5 kg (176.16 lb) 300 mm Converter 98.4 kg (218.0 lb)
Maximum Trailer Towing Capacity	6 130 kg (13,500 lb)
Maximum Gross Vehicle Weight (GVW)	3 900 kg (8,600 lb)

**Fastener Tightening Specifications**

Application	Specification	
	Metric	English
Accumulator Cover to Case Bolt	8.0-14.0 N·m	6-10 lb ft
Case Extension to Case Bolt	42.0-48.0 N·m	31-35 lb ft
Case Extension to Case Bolt (4WD Shipping)	11.2-22.6 N·m	8.3-16.7 lb ft
Converter Cover Bolt	10 N·m	89 lb in
Converter Housing to Case Screw	65.0-75.0 N·m	48-55 lb ft
Cooler Pipe Connector	35.0-41.0 N·m	26-30 lb ft
Detent Spring to Valve Body Bolt	20.0-27.0 N·m	15-20 lb ft
Floorshift Control Bolt	10 N·m	89 lb in
Flywheel to Torque Converter Bolt	63 N·m	46 lb ft
Forward Accumulator Cover to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Heat Shield to Transmission Bolt	17 N·m	13 lb ft
Line Pressure Plug	8.0-14.0 N·m	6-10 lb ft
Manual Shaft to Inside Detent Lever Nut	27.0-34.0 N·m	20-25 lb ft
Negative Battery Cable Bolt	15 N·m	11 lb ft
Oil Level Indicator Bolt	47 N·m	35 lb ft
Oil Pan to Transmission Case Bolt	11 N·m	97 lb in
Oil Passage Cover to Case Bolt	8-14.0 N·m	6-10 lb ft
Park Brake Bracket to Case Bolt	27.0-34.0 N·m	20-25 lb ft
Park/Neutral Position Switch Screw	3 N·m	27 lb in
Plate to Case Bolt (Shipping)	27.0-34.0 N·m	20-25 lb ft
Plate to Converter Bolt (Shipping)	27.0-34.0 N·m	20-25 lb ft
Plug Assembly, Automatic Transmission Oil Pan (C/K)	30-40 N·m	22.1-29.5 lb ft
Plug Assembly, Automatic Transmission Oil Pan (Y)	28-32 N·m	20.7-23.6 lb ft
Pressure Control Solenoid Bracket to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Pump Assembly to Case Bolt	26.0-32.0 N·m	19-24 lb ft
Pump Cover to Pump Body Bolt	20.0-27.0 N·m	15-20 lb ft
Shift Cable Grommet Screw	1.7 N·m	15 lb in
Shift Control Cable Attachment	20 N·m	15 lb ft
Speed Sensor Retainer Bolt	10.5-13.5 N·m	7.7-10 lb ft
Stud, Automatic Transmission Case Extension (Y-car)	18.0-22.0 N·m	13-16 lb ft
TCC Solenoid Assembly to Case Bolt	8.0-14.0 N·m	6-10 lb ft
Trans Mount to Transmission Bolt	25 N·m	18 lb ft
Transmission Fluid Pressure Manual Valve Position Switch to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Transmission Oil Cooler Pipe Fitting	35.0-41.0 N·m	26-30 lb ft
Transmission Oil Pan to Case Bolt	9.5-13.8 N·m	7-10 lb ft
Transmission to Engine Bolt	47 N·m	35 lb ft
Valve Body to Case Bolt	8.0-14.0 N·m	6-10 lb ft

## Fluid Capacity Specifications

Application	Specification	
	Metric	English
Bottom Pan Removal	4.7 liters	5 quarts
Complete Overhaul	10.6 liters	11 quarts
(measurements are approximate)		

## Transmission Component and System Description

The 4L60E transmission consists primarily of the following components:

- Torque converter assembly
- Servo assembly and 2-4 band assembly
- Reverse input clutch and housing
- Overrun clutch
- Forward clutch
- 3-4 clutch
- Forward sprag clutch assembly
- Lo and reverse roller clutch assembly
- Lo and reverse clutch assembly
- Two planetary gear sets: Input and Reaction
- Oil pump assembly
- Control valve body assembly

The electrical components of the 4L60-E are as follows:

- 1-2 and 2-3 shift solenoid valves
- 3-2 shift solenoid valve assembly
- Transmission pressure control (PC) solenoid
- Torque converter clutch (TCC) solenoid valve
- TCC pulse width modulation (PWM) solenoid valve
- Automatic transmission fluid pressure (TFP) manual valve position switch
- Automatic transmission fluid temperature (TFT) sensor
- Vehicle speed sensor assembly

## Adapt Function

### Transmission Adapt Function

The 4L60-E transmission uses a line pressure control system, which has the ability to continuously adapt the system's line pressure. This compensates for normal wear of the following parts:

- The clutch fiber plates
- The seals
- The springs

The PCM maintains the Upshift Adapt parameters for the transmission. The PCM monitors the AT ISS sensor and the AT OSS during commanded shifts in order to determine if a shift is occurring too fast or too slow. The PCM adjusts the signal from the transmission pressure control solenoid in order to maintain a set shift feel.

Transmission adapt must be reset whenever the transmission is overhauled or replaced.

### **Automatic Transmission Shift Lock Control Description**

The automatic transmission shift lock control is a safety device that prevents an inadvertent shift out of PARK when the ignition is ON. The driver must press the brake pedal before moving the shift lever out of the PARK position. The system consist of the following components:

- The automatic transmission shift lock control solenoid.
- The automatic transmission shift lock control switch.
- The park/neutral position switch.

With the ignition in the ON position battery positive voltage is supplied to the park/neutral position switch. With the transmission in the PARK position the contacts in the park/neutral position switch are closed. This allows current to flow through the switch to the automatic transmission shift lock control switch. The circuit continues through the normally-closed switch to the automatic transmission shift lock control solenoid. The automatic transmssion shift lock control soleniod is permanently grounded. This energizes the automatic transmission shift lock control solenoid, locking the shift linkage in the PARK position. When the driver presses the brake pedal the contacts in the automatic transmission shift lock control switch open, causing the automatic transmission shift lock control solenoid to release. This allows the shift lever to move from the PARK position.

**Automatic Transmission – 4L80E****Transmission General Specifications**

Name	Hydra-matic 4L80-E
RPO Codes	MT1
Production Location	Ypsilanti, MI
Vehicle Platform (Engine/Transmission) Usage	C/K, C/K 800, G, P32/42
Transmission Drive	Longitudinally Mounted Rear Wheel Drive
1st Gear Ratio	2.482:1
2nd Gear Ratio	1.482:1
3rd Gear Ratio	1.000:1
4th Gear Ratio	0.750:1
Reverse	2.077:1
Torque Converter Size (Diameter of Torque Converter Turbine)	310 mm
Pressure Taps	Line Pressure
Transmission Fluid Type	DEXRON® III
Transmission Fluid Capacity (Approximate)	Bottom Pan Removal: 7.3L (7.7 qts) Dry: 12.8L (13.5 qts)
Transmission Type: 4	Four Forward Gears
Transmission Type: L	Longitudinal Mount
Transmission Type: 80	Product Series
Transmission Type: E	Electronic Controls
Position Quadrant	P, R, N, Overdrive, D, 2, 1
Case Material	Die Cast Aluminum
Transmission Weight Dry	107 kg (236 lbs)
Transmission Weight Wet	118 kg (260 lbs)
Maximum Trailer Towing Capacity	9,525 kg (21,000 lbs)
Maximum Gross Vehicle Weight (GVW)	7,258 kg (16,000 lbs)

**Fastener Tightening Specifications**

Application	Specification	
	Metric	English
Accumulator Housing to Valve Body	11 N·m	97 lb in
Case Center Support	44 N·m	32 lb ft
Control Valve Assembly to Case	11 N·m	97 lb in
Cooler Pipe Connector Nut at Case and Radiator	38 N·m	28 lb ft
Engine Rear Mount to Transmission Bolt	44 N·m	32 lb ft
Engine Rear Support Bracket to Frame Nut	44 N·m	32 lb ft
Extension Housing to Case	34 N·m	25 lb ft
Flywheel Housing Cover to Transmission	7 N·m	62 lb in
Flywheel to Converter	44 N·m	32 lb ft
Fourth Clutch	23 N·m	17 lb ft
Manual Shaft to Detent Lever Nut	24 N·m	18 lb ft
Oil Pan Drain Plug	34 N·m	25 lb ft
Oil Pan to Case	24 N·m	18 lb ft
Oil Test Hole Plug	11 N·m	97 lb in
Parking Pawl Bracket to Case	24 N·m	18 lb ft
Pressure Control Solenoid Bracket to Valve Body	8 N·m	71 lb in
Pump Assembly to Case	24 N·m	18 lb ft
Pump Body to Cover	24 N·m	18 lb ft
Rear Servo Cover to Case	24 N·m	18 lb ft

Solenoid to Valve Body	8 N·m	71 lb in
Speed Sensor and Bracket Assembly to Case	11 N·m	97 lb in
Transmission Case to Engine	44 N·m	32 lb ft
Valve Body to Case/Lube Pipe	11 N·m	97 lb in
Valve Body to Case/PSM	11 N·m	97 lb in

### Fluid Capacity Specifications Overhaul

Application	Specification	
	Metric	English
Oil Pan Removal	7.3 liters	7.7 quarts
Overhaul	12.8 liters	13.5 quarts

### Transmission General Description

The 4L80-E is a fully automatic rear wheel drive electronically controlled transmission. The 4L80-E provides four forward ranges including overdrive and reverse. A gear type of oil pump controls shift points. The VCM/PCM and the pressure control (PC) solenoid (force motor) regulate these shift points. The VCM/PCM also controls shift schedules and TCC apply rates. Transmission temperature also influences shift schedules and TCC apply rates.

You can operate the transmission in any one of the following seven modes:

- P - PARK position prevents the vehicle from rolling either forward or backward on vehicles less than 15,000 G.V.W. For safety reasons, use the parking brake in addition to the park position.
- R - REVERSE allows the vehicle to be operated in a rearward direction.
- N - NEUTRAL allows the engine to be started and operated while driving the vehicle. If necessary, you may select this position in order to restart the engine with the vehicle moving.
- OD - OVERDRIVE is used for all normal driving conditions. Overdrive provides four gear ratios plus a converter clutch operation. Depress the accelerator in order to downshift for safe passing.
- D - DRIVE position is used for city traffic, and hilly terrain. Drive provides three gear ranges. Depress the accelerator in order to downshift.
- 2 - Manual SECOND provides acceleration and engine braking or greater traction from a stop. When you choose manual SECOND, the vehicle will start out in first gear and upshift to second gear. You may select this gear at a vehicle speed of up to 22 km/h (35 mph).
- 1 - Manual LOW provides maximum engine braking. You may select this gear at a vehicle speed of up to 13 km/h (20 mph).

## Abbreviations and Meanings

Abbreviation	Meaning
<b>A</b>	
A	Ampere(s)
ABS	Antilock Brake System
A/C	Air Conditioning
AC	Alternating Current
ACC	Accessory, Automatic Climate Control
ACL	Air Cleaner
ACR4	Air Conditioning Refrigerant, Recovery, Recycling, Recharging
AD	Automatic Disconnect
A/D	Analog to Digital
ADL	Automatic Door Lock
A/F	Air/Fuel Ratio
AH	Active Handling
AIR	Secondary Air Injection
ALC	Automatic Level Control, Automatic Lamp Control
AM/FM	Amplitude Modulation/Frequency Modulation
Ant	Antenna
AP	Accelerator Pedal
APCM	Accessory Power Control Module
API	American Petroleum Institute
APP	Accelerator Pedal Position
APT	Adjustable Part Throttle
ASM	Assembly, Accelerator and Servo Control Module
ASR	Acceleration Slip Regulation
A/T	Automatic Transmission/Transaxle
ATC	Automatic Transfer Case, Automatic Temperature Control
ATDC	After Top Dead Center
ATSLC	Automatic Transmission Shift Lock Control
Auto	Automatic
avg	Average
A4WD	Automatic Four-Wheel Drive
AWG	American Wire Gage
<b>B</b>	
B+	Battery Positive Voltage
BARO	Barometric Pressure
BATT	Battery
BBV	Brake Booster Vacuum
BCA	Bias Control Assembly
BCM	Body Control Module

BHP	Brake Horsepower
BLK	Black
BLU	Blue
BP	Back Pressure
BPCM	Battery Pack Control Module
BPMV	Brake Pressure Modulator Valve
BPP	Brake Pedal Position
BRN	Brown
BTDC	Before Top Dead Center
BTM	Battery Thermal Module
BTSI	Brake Transmission Shift Interlock
Btu	British Thermal Units

**C**

°C	Degrees Celsius
CAC	Charge Air Cooler
CAFE	Corporate Average Fuel Economy
Cal	Calibration
Cam	Camshaft
CARB	California Air Resources Board
CC	Coast Clutch
cm <sup>3</sup>	Cubic Centimeters
CCM	Convenience Charge Module, Chassis Control Module
CCOT	Cycling Clutch Orifice Tube
CCP	Climate Control Panel
CD	Compact Disc
CE	Commutator End
CEAB	Cold Engine Air Bleed
CEMF	Counter Electromotive Force
CEX	Cabin Exchanger
cfm	Cubic Feet per Minute
cg	Center of Gravity
CID	Cubic Inch Displacement
CKP	Crankshaft Position
CKT	Circuit
C/Ltr	Cigar Lighter
CL	Closed Loop
CLS	Coolant Level Switch
CMC	Compressor Motor Controller
CMP	Camshaft Position
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO2	Carbon Dioxide

Coax	Coaxial
COMM	Communication
Conn	Connector
CPA	Connector Position Assurance
CPP	Clutch Pedal Position
CPS	Central Power Supply
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CRTC	Cathode Ray Tube Controller
CS	Charging System
CSFI	Central Sequential Fuel Injection
CTP	Closed Throttle Position
cu ft	Cubic Foot/Feet
cu in	Cubic Inch/Inches
CV	Constant Velocity Joint
CVRSS	Continuously Variable Road Sensing Suspension
Cyl	Cylinder(s)
<b>D</b>	
DAB	Delayed Accessory Bus
dB	Decibels
dBA	Decibels on A-weighted Scale
DC	Direct Current, Duty Cycle
DCM	Door Control Module
DE	Drive End
DEC	Digital Electronic Controller
DERM	Diagnostic Energy Reserve Module
DI	Distributor Ignition
dia	Diameter
DIC	Driver Information Center
Diff	Differential
DIM	Dash Integration Module
DK	Dark
DLC	Data Link Connector
DMCM	Drive Motor Control Module
DMM	Digital Multimeter
DMSDS	Drive Motor Speed and Direction Sensor
DMU	Drive Motor Unit
DOHC	Dual Overhead Camshafts
DR, Drvr	Driver
DRL	Daytime Running Lamps
DTC	Diagnostic Trouble Code

<b>E</b>	
EBCM	Electronic Brake Control Module
EBTCM	Electronic Brake and Traction Control Module
EC	Electrical Center, Engine Control
ECC	Electronic Climate Control
ECI	Extended Compressor at Idle
ECL	Engine Coolant Level
ECM	Engine Control Module, Electronic Control Module
ECS	Emission Control System
ECT	Engine Coolant Temperature
EEPROM	Electrically Erasable Programmable Read Only Memory
EEVIR	Evaporator Equalized Values in Receiver
FE	Early Fuel Evaporation
EGR	Exhaust Gas Recirculation
EGR TVV	Exhaust Gas Recirculation Thermal Vacuum Valve
EHPS	Electro-Hydraulic Power Steering
EI	Electronic Ignition
ELAP	Elapsed
ELC	Electronic Level Control
E/M	English/Metric
EMF	Electromotive Force
EMI	Electromagnetic Interference
Eng	Engine
EOP	Engine Oil Pressure
EOT	Engine Oil Temperature
EPA	Environmental Protection Agency
EPR	Exhaust Pressure Regulator
EPROM	Erasable Programmable Read Only Memory
ESB	Expansion Spring Brake
ESC	Electronic Suspension Control
ESD	Electrostatic Discharge
ESN	Electronic Serial Number
ETC	Electronic Throttle Control, Electronic Temperature Control, Electronic Timing Control
ETCC	Electronic Touch Climate Control
ETR	Electronically Tuned Receiver
ETS	Enhanced Traction System
EVAP	Evaporative Emission
EVO	Electronic Variable Orifice
Exh	Exhaust

<b>F</b>	
°F	Degrees Fahrenheit
FC	Fan Control
FDC	Fuel Data Center
FED	Federal All United States except California
FEDS	Fuel Enable Data Stream
FEX	Front Exchanger
FF	Flexible Fuel
FFH	Fuel-Fired Heater
FI	Fuel Injection
FMVSS	Federal U.S. Motor Vehicle Safety Standards
FP	Fuel Pump
ft	Foot/Feet
FT	Fuel Trim
F4WD	Full Time Four-Wheel Drive
4WAL	Four-Wheel Antilock
4WD	Four-Wheel Drive
FW	Flat Wire
FWD	Front Wheel Drive, Forward
<b>G</b>	
g	Grams, Gravitational Acceleration
GA	Gage, Gauge
gal	Gallon
gas	Gasoline
GCW	Gross Combination Weight
Gen	Generator
GL	Gear Lubricant
GM	General Motors
GM SPO	General Motors Service Parts Operations
gnd	Ground
gpm	Gallons per Minute
GRN	Green
GRY	Gray
GVWR	Gross Vehicle Weight Rating
<b>H</b>	
H	Hydrogen
H2O	Water
Harn	Harness
HC	Hydrocarbons
H/CMPR	High Compression

HD	Heavy Duty
HDC	Heavy Duty Cooling
hex	Hexagon, Hexadecimal
Hg	Mercury
Hi Alt	High Altitude
HO2S	Heated Oxygen Sensor
hp	Horsepower
HPL	High Pressure Liquid
HPS	High Performance System
HPV	High Pressure Vapor
HPVS	Heat Pump Ventilation System
Htd	Heated
HTR	Heater
HUD	Head-up Display
HVAC	Heater-Ventilation-Air Conditioning
HVACM	Heater-Vent-Air Conditioning Module
HVIL	High Voltage Interlock Loop
HVM	Heater Vent Module
Hz	Hertz
I	
IAC	Idle Air Control
IAT	Intake Air Temperature
IC	Integrated Circuit, Ignition Control
ICCS	Integrated Chassis Control System
ICM	Ignition Control Module
ID	Identification, Inside Diameter
IDI	Integrated Direct Ignition
IGBT	Insulated Gate Bi-Polar Transistor
ign	Ignition
ILC	Idle Load Compensator
in	Inch/Inches
INJ	Injection
inst	Instantaneous, Instant
IP	Instrument Panel
IPC	Instrument Panel Cluster
IPM	Instrument Panel Module
IPEC	Instrument Panel Electrical Center
ISC	Idle Speed Control
ISO	International Standards Organization
ISS	Input Speed Shaft, Input Shaft Speed

<b>K</b>	
KAM	Keep Alive Memory
KDD	Keyboard Display Driver
kg	Kilogram
kHz	Kilohertz
km	Kilometer
km/h	Kilometers per Hour
km/l	Kilometers per Liter
kPa	Kilopascals
KS	Knock Sensor
kV	Kilovolts
<b>L</b>	
L	Liter
L4	Four Cylinder Engine, In-Line
L6	Six-Cylinder Engine, In-Line
lb	Pound
lb ft	Pound Feet Torque
lb in	Pound Inch Torque
LCD	Liquid Crystal Display
LDCL	Left Door Closed Locking
LDCM	Left Door Control Module
LDM	Lamp Driver Module
LED	Light Emitting Diode
LEV	Low Emissions Vehicle
LF	Left Front
lm	Lumens
LR	Left Rear
LT	Left
LT	Light
LT	Long Term
LTPI	Low Tire Pressure Indicator
LTPWS	Low Tire Pressure Warning System
<b>M</b>	
MAF	Mass Air Flow
Man	Manual
MAP	Manifold Absolute Pressure
MAT	Manifold Absolute Temperature
max	Maximum
M/C	Mixture Control
MDP	Manifold Differential Pressure

MFI	Multiport Fuel Injection
mi	Miles
MIL	Malfunction Indicator Lamp
min	Minimum
MIN	Mobile Identification Number
mL	Milliliter
mm	Millimeter
mpg	Miles per Gallon
mph	Miles per Hour
ms	Millisecond
MST	Manifold Surface Temperature
MSVA	Magnetic Steering Variable Assist, Magnasteer®
M/T	Manual Transmission/Transaxle
MV	Megavolt
mV	Millivolt

**N**

NAES	North American Export Sales
NC	Normally Closed
NEG	Negative
Neu	Neutral
NI	Neutral Idle
NiMH	Nickel Metal Hydride
NLGI	National Lubricating Grease Institute
N·m	Newton-meter Torque
NO	Normally Open
NOx	Oxides of Nitrogen
NPTC	National Pipe Thread Coarse
NPTF	National Pipe Thread Fine
NOVRAM	Non-Volatile Random Access Memory

**O**

O2	Oxygen
O2S	Oxygen Sensor
OBD	On-Board Diagnostics
OBD II	On-Board Diagnostics Second Generation
OC	Oxidation Converter Catalytic
OCS	Opportunity Charge Station
OD	Outside Diameter
ODM	Output Drive Module
ODO	Odometer
OE	Original Equipment
OEM	Original Equipment Manufacturer
OHC	Overhead Camshaft

ohms	Ohm
OL	Open Loop, Out of Limits
ORC	Oxidation Reduction Converter Catalytic
ORN	Orange
ORVR	On-Board Refueling Vapor Recovery
OSS	Output Shaft Speed
oz	Ounce(s)
<b>P</b>	
PAG	Polyalkylene Glycol
PAIR	Pulsed Secondary Air Injection
PASS, PSGR	Passenger
PASS-Key®	Personalized Automotive Security System
P/B	Power Brakes
PC	Pressure Control
PCB	Printed Circuit Board
PCM	Powertrain Control Module
PCS	Pressure Control Solenoid
PCV	Positive Crankcase Ventilation
PEB	Power Electronics Bay
PID	Parameter Identification
PIM	Power Inverter Module
PM	Permanent Magnet Generator
P/N	Part Number
PNK	Pink
PNP	Park/Neutral Position
PRNDL	Park, Reverse, Neutral, Drive, Low
POA	Pilot Operated Absolute Valve
POS	Positive, Position
POT	Potentiometer Variable Resistor
PPL	Purple
ppm	Parts per Million
PROM	Programmable Read Only Memory
P/S, PS	Power Steering
PSCM	Power Steering Control Module, Passenger Seat Control Module
PSD	Power Sliding Door
PSP	Power Steering Pressure
psi	Pounds per Square Inch
psia	Pounds per Square Inch Absolute
psig	Pounds per Square Inch Gauge
pt	Pint
PTC	Positive Temperature Coefficient
PWM	Pulse Width Modulated

<b>Q</b>	
QDM	Quad Driver Module
qt	Quart(s)
<b>R</b>	
R-12	Refrigerant-12
R-134a	Refrigerant-134a
RAM	Random Access Memory, Non-permanent memory device, memory contents are lost when power is removed.
RAP	Retained Accessory Power
RAV	Remote Activation Verification
RCDLR	Remote Control Door Lock Receiver
RDCM	Right Door Control Module
Ref	Reference
Rev	Reverse
REX	Rear Exchanger
RIM	Rear Integration Module
RF	Right Front, Radio Frequency
RFA	Remote Function Actuation
RFI	Radio Frequency Interference
RH	Right Hand
RKE	Remote Keyless Entry
Rly	Relay
ROM	Read Only Memory, Permanent memory device, memory contents are retained when power is removed.
RPM	Revolutions per Minute Engine Speed
RPO	Regular Production Option
RR	Right Rear
RSS	Road Sensing Suspension
RTD	Real Time Damping
RT	Right
RTV	Room Temperature Vulcanizing Sealer
RWAL	Rear Wheel Antilock
RWD	Rear Wheel Drive
<b>S</b>	
s	Second(s)
SAE	Society of Automotive Engineers
SC	Supercharger
SCB	Supercharger Bypass
SCM	Seat Control Module
SDM	Sensing and Diagnostic Module
SEO	Special Equipment Option
SFI	Sequential Multiport Fuel Injection

SI	System International Modern Version of Metric System
SIAB	Side Impact Air Bag
SIR	Supplemental Inflatable Restraint
SLA	Short/Long Arm Suspension
sol	Solenoid
SO2	Sulfur Dioxide
SP	Splice Pack
S/P	Series/Parallel
SPO	Service Parts Operations
SPS	Service Programming System, Speed Signal
sq ft, ft <sup>2</sup>	Square Foot/Feet
sq in, in <sup>2</sup>	Square Inch/Inches
SRC	Service Ride Control
SRI	Service Reminder Indicator
SRS	Supplemental Restraint System
SS	Shift Solenoid
ST	Scan Tool
STID	Station Identification Station ID
S4WD	Selectable Four-Wheel Drive
Sw	Switch
SWPS	Steering Wheel Position Sensor
syn	Synchronizer

**T**

TAC	Throttle Actuator Control
Tach	Tachometer
TAP	Transmission Adaptive Pressure, Throttle Adaptive Pressure
TBI	Throttle Body Fuel Injection
TC	Turbocharger, Transmission Control
TCC	Torque Converter Clutch
TCS	Traction Control System
TDC	Top Dead Center
TEMP	Temperature
Term	Terminal
TFP	Transmission Fluid Pressure
TFT	Transmission Fluid Temperature
THM	Turbo Hydro-Matic
TIM	Tire Inflation Monitoring, Tire Inflation Module
TOC	Transmission Oil Cooler
TP	Throttle Position
TPA	Terminal Positive Assurance
TPM	Tire Pressure Monitoring, Tire Pressure Monitor
TR	Transmission Range

TRANS	Transmission/Transaxle
TT	Tell Tail Warning Lamp
TV	Throttle Valve
TVRS	Television and Radio Suppression
TVV	Thermal Vacuum Valve
TWC	Three Way Converter Catalytic
TWC+OC	Three Way + Oxidation Converter Catalytic
TXV	Thermal Expansion Valve
<b>U</b>	
UART	Universal Asynchronous Receiver Transmitter
U/H	Underhood
U/HEC	Underhood Electrical Center
U-joint	Universal Joint
UTD	Universal Theft Deterrent
UV	Ultraviolet
<b>V</b>	
V	Volt(s), Voltage
V6	Six-Cylinder Engine, V-Type
V8	Eight-Cylinder Engine, V-Type
Vac	Vacuum
VAC	Vehicle Access Code
VATS	Vehicle Anti-Theft System
VCIM	Vehicle Communication Interface Mode
VCM	Vehicle Control Module
V dif	Voltage Difference
VDOT	Variable Displacement Orifice Tube
VDV	Vacuum Delay Valve
vel	Velocity
VES	Variable Effort Steering
VF	Vacuum Fluorescent
VIO	Violet
VIN	Vehicle Identification Number
VLR	Voltage Loop Reserve
VMV	Vacuum Modulator Valve
VR	Voltage Regulator
V ref	Voltage Reference
VSES	Vehicle Stability Enhancement System
VSS	Vehicle Speed Sensor

W	
w/	With
W/B	Wheel Base
WHL	Wheel
WHT	White
w/o	Without
WOT	Wide Open Throttle
W/P	Water Pump
W/S	Windshield
WSS	Wheel Speed Sensor
WU-OC	Warm Up Oxidation Converter Catalytic
WU-TWC	Warm Up Three-Way Converter Catalytic
X	
X-valve	Expansion Valve
Y	
yd	Yard(s)
YEL	Yellow

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## Conversion - English/Metric

English	Multiply/ Divide by	Metric
In order to calculate English measurement, divide by the number in the center column.		
In order to calculate metric measurement, multiply by the number in the center column.		
<b>Length</b>		
in	25.4	mm
ft	0.3048	m
yd	0.9144	
mi	1.609	km
<b>Area</b>		
sq in	645.2	sq mm
	6.45	sq cm
sq ft	0.0929	sq m
sq yd	0.8361	
<b>Volume</b>		
cu in	16,387.00	cu mm
	16.387	cu cm
	0.0164	L
qt	0.9464	
gal	3.7854	
cu yd	0.764	cu m
<b>Mass</b>		
ton	0.4536	kg
	907.18	
	0.907	tonne (t)
<b>Force</b>		
Kg F	9.807	newtons (N)
oz F	0.278	
lb F	4.448	
<b>Acceleration</b>		
ft/s <sup>2</sup>	0.3048	m/s <sup>2</sup>
in/s <sup>2</sup>	0.0254	
<b>Torque</b>		
Lb in	0.11298	N·m
lb ft	1.3558	
<b>Power</b>		
hp	0.745	kW

<b>Pressure (Stress)</b>		
inches of H2O	0.2488	kPa
lb/sq in	6.895	
<b>Energy (Work)</b>		
Btu	1055	J (J= one Ws)
lb ft	1.3558	
kW hour	3,600,000.00	
<b>Light</b>		
Foot Candle	10.764	lm/m <sup>2</sup>
<b>Velocity</b>		
mph	1.6093	km/h
<b>Temperature</b>		
(°F - 32) 5/9	=	°C
°F	=	(9/5 °C + 32)
<b>Fuel Performance</b>		
235.215/mpg	=	100 km/L

## Equivalents - Decimal and Metric

Fraction (in)	Decimal (in)	Metric (mm)
1/64	0.015625	0.39688
1/32	0.03125	0.79375
3/64	0.046875	1.19062
1/16	0.0625	1.5875
5/64	0.078125	1.98437
3/32	0.09375	2.38125
7/64	0.109375	2.77812
1/8	0.125	3.175
9/64	0.140625	3.57187
5/32	0.15625	3.96875
11/64	0.171875	4.36562
3/16	0.1875	4.7625
13/64	0.203125	5.15937
7/32	0.21875	5.55625
15/64	0.234375	5.95312
1/4	0.25	6.35
17/64	0.265625	6.74687
9/32	0.28125	7.14375
19/64	0.296875	7.54062
5/16	0.3125	7.9375
21/64	0.328125	8.33437
11/32	0.34375	8.73125
23/64	0.359375	9.12812
3/8	0.375	9.525
25/64	0.390625	9.92187
13/32	0.40625	10.31875
27/64	0.421875	10.71562
7/16	0.4375	11.1125
29/64	0.453125	11.50937
15/32	0.46875	11.90625
31/64	0.484375	12.30312
1/2	0.5	12.7
33/64	0.515625	13.09687
17/32	0.53125	13.49375
35/64	0.546875	13.89062
9/16	0.5625	14.2875
37/64	0.578125	14.68437
19/32	0.59375	15.08125
39/64	0.609375	15.47812

Fraction (in)	Decimal (in)	Metric (mm)
5/8	0.625	15.875
41/64	0.640625	16.27187
21/32	0.65625	16.66875
43/64	0.671875	17.06562
11/16	0.6875	17.4625
45/64	0.703125	17.85937
23/32	0.71875	18.25625
47/64	0.734375	18.65312
3/4	0.75	19.05
49/64	0.765625	19.44687
25/32	0.78125	19.84375
51/64	0.796875	20.24062
13/16	0.8125	20.6375
53/64	0.828125	21.03437
27/32	0.84375	21.43125
55/64	0.859375	21.82812
7/8	0.875	22.225
57/64	0.890625	22.62187
29/32	0.90625	23.01875
59/64	0.921875	23.41562
15/16	0.9375	23.8125
61/64	0.953125	24.20937
31/32	0.96875	24.60625
63/64	0.984375	25.00312
1	1.0	25.4

## Fasteners

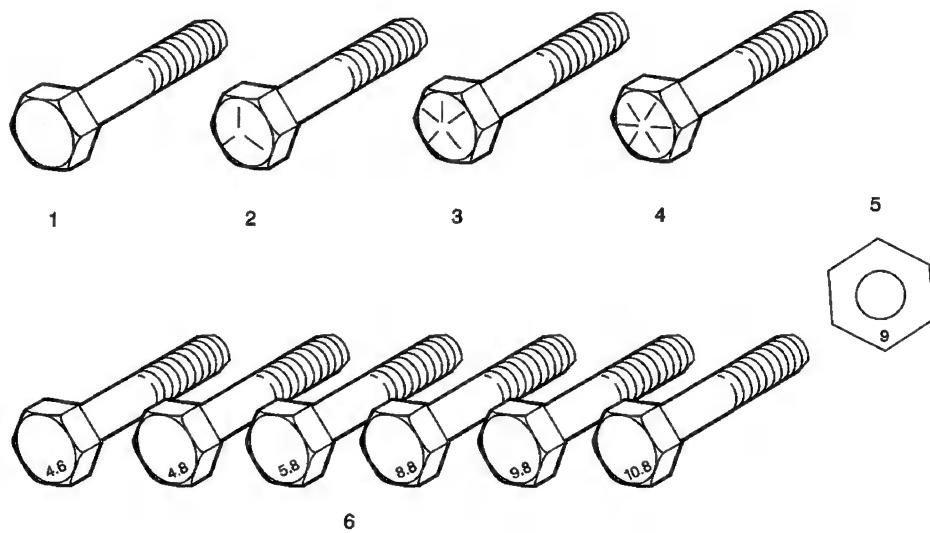
### Metric Fasteners

This vehicle provides fastener dimensions using the metric system. Most metric fasteners are approximate in diameter to equivalent English fasteners. Make replacements using fasteners of the same nominal diameter, thread pitch, and strength.

A number marking identifies the OE metric fasteners except cross-recess head screws. The number also indicates the strength of the fastener material. A Posidrive® or Type 1A cross-recess identifies a metric cross-recess screw. For best results, use a Type 1A cross-recess screwdriver, or equivalent, in Posidrive® recess head screws.

GM Engineering Standards and North American Industries have adopted a portion of the ISO-defined standard metric fastener sizes. The purpose was to reduce the number of fastener sizes used while retaining the best thread qualities in each thread size. For example, the metric M6.0 X 1 screw, with nearly the same diameter and 25.4 threads per inch replaced the English 1/4-20 and 1/4-28 screws. The thread pitch is midway between the English coarse and fine thread pitches.

### Fastener Strength Identification



1. English Bolt, Grade 2 (Strength Class)
2. English Bolt, Grade 5 (Strength Class)
3. English Bolt, Grade 7 (Strength Class)
4. English Bolt, Grade 8 (Strength Class)
5. Metric Nut, Strength Class 9
6. Metric Bolts, Strength Class Increases as Numbers Increase

The most commonly used metric fastener strength property classes are 9.8 and 10.9. The class identification is embossed on the head of each bolt. The English, inch strength classes range from grade 2 to grade 8. Radial lines are embossed on the head of each bolt in order to identify the strength class. The number of lines on the head of the bolt is 2 lines less than the actual grade. For example, a grade 8 bolt will have 6 radial lines on the bolt head. Some metric nuts are marked with a single digit strength identification number on the nut face.

The correct fasteners are available through GM SPO. Many metric fasteners available in the aftermarket parts channels are designed to metric standards of countries other than the United States, and may exhibit the following:

- Lower strength
- No numbered head marking system
- Wrong thread pitch

The metric fasteners on GM products are designed to new, international standards. The following are the common sizes and pitches, except for special applications:

- M6.0 X 1
- M8 X 1.25
- M10 X 1.5
- M12 X 1.75
- M14 X 2.00
- M16 X 2.00

### **Prevailing Torque Fasteners**

Prevailing torque fasteners create a thread interface between the fastener and the fastener counterpart in order to prevent the fastener from loosening.

#### **All Metal Prevailing Torque Fasteners**

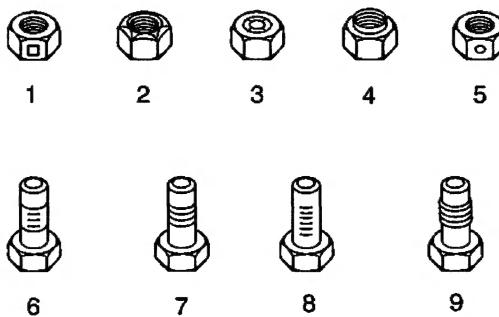
These fasteners accomplish the thread interface by a designed distortion or deformation in the fastener.

#### **Nylon Interface Prevailing Torque Fasteners**

These fasteners accomplish the thread interface by the presence of a nylon material on the fastener threads.

#### **Adhesive Coated Fasteners**

These fasteners accomplish the thread interface by the presence of a thread-locking compound on the fastener threads. Refer to the appropriate repair procedure in order to determine if the fastener may be reused and the applicable thread-locking compound to apply to the fastener.



1. Prevailing Torque Nut, Center Lock Type

2. Prevailing Torque Nut, Top Lock Type
3. Prevailing Torque Nut, Nylon Patch Type
4. Prevailing Torque Nut, Nylon Washer Insert Type
5. Prevailing Torque Nut, Nylon Insert Type
6. Prevailing Torque Bolt, Dry Adhesive Coating Type
7. Prevailing Torque Bolt, Thread Profile Deformed Type
8. Prevailing Torque Bolt, Nylon Strip Type
9. Prevailing Torque Bolt, Out-of-Round Thread Area Type

A prevailing torque fastener may be reused ONLY if:

- The fastener and the fastener counterpart are clean and not damaged
- There is no rust on the fastener
- The fastener develops the specified minimum torque against its counterpart prior to the fastener seating

### **Metric Prevailing Torque Fastener Minimum Torque Development**

<b>Application</b>	<b>Specification</b>	
	<b>Metric</b>	<b>English</b>
<b>All Metal Prevailing Torque Fasteners</b>		
6 mm	0.4 N·m	4 lb in
8 mm	0.8 N·m	7 lb in
10 mm	1.4 N·m	12 lb in
12 mm	2.1 N·m	19 lb in
14 mm	3 N·m	27 lb in
16 mm	4.2 N·m	37 lb in
20 mm	7 N·m	62 lb in
24 mm	10.5 N·m	93 lb in
<b>Nylon Interface Prevailing Torque Fasteners</b>		
6 mm	0.3 N·m	3 lb in
8 mm	0.6 N·m	5 lb in
10 mm	1.1 N·m	10 lb in
12 mm	1.5 N·m	13 lb in
14 mm	2.3 N·m	20 lb in
16 mm	3.4 N·m	30 lb in
20 mm	5.5 N·m	49 lb in
24 mm	8.5 N·m	75 lb in

**English Prevailing Torque Fastener Minimum Torque Development**

Application	Specification	
	Metric	English
<b>All Metal Prevailing Torque Fasteners</b>		
1/4 in	0.5 N·m	4.5 lb in
5/16 in	0.8 N·m	7.5 lb in
3/8 in	1.3 N·m	11.5 lb in
7/16 in	1.8 N·m	16 lb in
1/2 in	2.3 N·m	20 lb in
9/16 in	3.2 N·m	28 lb in
5/8 in	4 N·m	36 lb in
3/4 in	7 N·m	54 lb in
<b>Nylon Interface Prevailing Torque Fasteners</b>		
1/4 in	0.3 N·m	3 lb in
5/16 in	0.6 N·m	5 lb in
3/8 in	1 N·m	9 lb in
7/16 in	1.3 N·m	12 lb in
1/2 in	1.8 N·m	16 lb in
9/16 in	2.5 N·m	22 lb in
5/8 in	3.4 N·m	30 lb in
3/4 in	5 N·m	45 lb in

2000 Chevrolet C/K & Silverado Truck Restoration Kit